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THIS JOURNAL *is non-political and seeks only to further the pursuit of knowledge. Its main purpose is to communicate to scholars abroad the results of scientific investigations of the Near East as carried out in Israel. But as fruitful work can be accomplished only by reciprocal endeavour, papers from contributors in other countries will be gladly considered. The subjects to be dealt with include: the history, archaeology and culture of the countries of the Near East, as well as their geography and natural features. — The Editors are not responsible for the opinions expressed by contributors.*

Israel Exploration Journal

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The Movement and Solution of Salt Bodies as Applied to Mount Sdom

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THE tectonics and erosion of salt beds belong to some rather fascinating chapters of geology. Salt being highly susceptible both to pressure and to solution will begin, under the impact of even a very slight force, to fold into an intricate pattern, or, from the slightest of wettings, to form into an interesting Karst topography. Since its susceptibility to erosional processes has resulted in the disappearance of most salt-beds from the surface of the earth, studies of its features are usually made in underground deposits, accessible only in wells or mines. Israel, however, is fortunate in having on its surface a large salt mountain, Mount Sdom, in the Dead Sea rift valley, preserved by the desert climate and possessing all the main classical features to be found in salt structures.

It would seem that in the past many observers have been led astray in their understanding of this mountain by the multitude of its outcrops and their peculiar features, and by an ignorance of the laws of salt movement and solution. It is my hope to present in this paper a more coherent and systematic picture of this salt phenomenon.

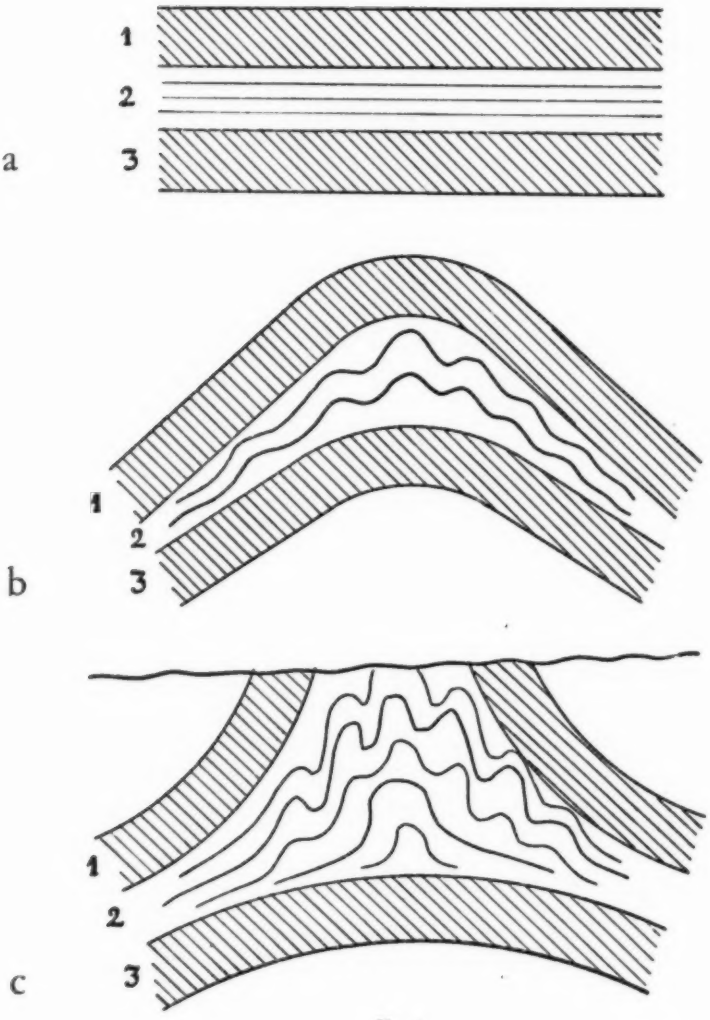

Fig. 1.

a: conform beds
b: anticline
c: pierced anticline

1: overlier
2: salt
3: underlier

THE LAWS OF SALT MOVEMENT

There exist two main types of salt structures in relation to their adjacent rocks, the 'conform' and the 'diapyric'. In the conform type the salt structure closely parallels the structures of the underlying and overlying (superincumbent) rocks. In the diapyric type the salt breaks through the overlying formations and in following its own laws, develops a lively type of folded structure: this diapyric type justifies the consideration of salt-tectonics as being different from the tectonics of ordinary rock. There exists, as well, every gradation between the conform and the diapyric types.

For convenience in discussion, three stages in the transition from the pure conform type to the pure diapyric type may be outlined as follows: (a) the conform type of salt structure, where the salt remains more or less in the same structural position as its environment, can exist only in very undisturbed regions (fig. 1a). (b) As soon as simple folds occur, the conformity with the adjacent formations disappears, the salt tending to accumulate towards the cores of the folds or anticlines, forming 'incompetent' beds (fig. 1 b). (c) The next stage is for the salt to break upwards through the rock itself, bending into contortions completely independent of the structure of the surrounding formations (fig. 1c). Even though the anticlinal structure surrounding the salt may be rather simple, the forms of salt intrusion are extremely diversified.

Should rock deposits be found in the incompetent salt-beds which fold or fault closely parallel with them, the rock deposits must have been formed as interliers within the salt, and cannot belong either to the underlying or to the overlying formations between which the salt had originally been deposited. In all three of the above stages, small salt intrusions into any overlying strata may occur: these are connected with pressure relief of the salt (micro-tectonic salt movements) where the overlying strata are cracked, and they bear no relation to the problem of the character of the main salt body.

SALT MOVEMENT OF MOUNT SDOM

Mount Sdom (the Mountain of Sodom, Jebel Usdum), a mountain 11 km. long by 2 km. wide, is surrounded by Pliocene clay-beds of about 1,000

metres in thickness. These clay-beds dip away from the salt body, forming an anticlinal continuous structure. The clay-beds do not exist on top of the mountain, so that the salt body must have broken through the anticlinal structure, as in stage (c) above.

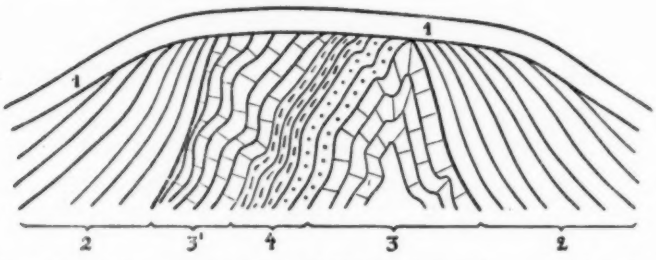

Fig. 2. Schematic cross-section through Mount Sdom without subrosion effects.
1: Lisan marl (Pleistocene) 2: Pliocene clay-beds
3: Lower salt-beds 3': Upper salt-beds 4: Usdum series (Miocene?)

Both on the rim of the clay-beds and on the top of the mountain are Middle Pleistocene Lisan marls, thin bedded white gypsum marls which rest conformably on the clay-beds. Their relation to the salt is more or less as would be found in stage (b) above. It would seem that the main movement of salt broke through the anticlinal clay-beds in post-Pliocene times, and that a later movement in the younger Pleistocene bent the Lisan marls upwards.

The main body of Mount Sdom is composed not only of the massive salt-beds, but also of a series of variegated sandstone, shale, thin gypsum beds and fresh-water dolomite called the 'Usdum Series'. This series is about 200 m. thick and is probably of Miocene age. It seems to cover the massive salt-beds, its strikes and dips following very closely those of the salt-beds underlying it. According to the discussion above (cf. p. 187), the Usdum series being conform with the salt, there must be an interlier within the salt, so that a second layer of salt should normally overlie it. There seem to be many indications of the existence of this second layer, though at first glance it is not visible.

At one small place in the mountain, in a solution cave, there is a local exception to the parallelism between the strikes and dips of the salt and

the Usdum series: a 20 m. wide mushroom-shaped intrusion of salt pierces a crack in the overlying sandstone. It seems that Mitchell and Blake, overrating the importance of this intrusion, concluded that the salt had originated from a great depth below the Usdum series. As has

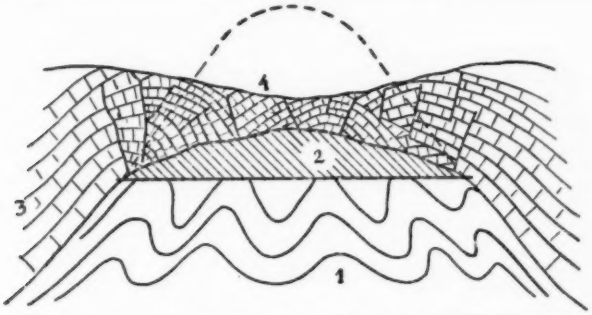

Fig. 3. Schematic cross-section through subroded salt structure.

1: Salt 2: Caprock (separated from 1 by salt level)
3: Overlying rocks 4: Undermined and collapsed overlying rocks

been pointed out, however, such small intrusions can occur even in conform types of salt-beds.

Granting, then, that the Usdum series is an interlier within the salt, it must also be concluded that the salt and the Usdum series are contemporaneous deposits. Picard has already pointed out that the Usdum and salt series belong together, though other authors had suggested a more deep-seated origin for the salt.[1] In support of his theory, Picard noted: (a) the arid character of the Usdum series, laid down during the same climatic conditions as the salt; (b) that some of the shales are clearly intercalated in the lower salt-beds, and (c) that only the Middle Tertiary could have been a suitable period for the deposition of the salt.

There is one more argument in favour of a shallow and Tertiary origin for the salt: the fact that the original layering of the salt, the polygonal cracks within the salt-beds, and the ripple marks on their surface, are well preserved.

[1] For references see bibliographical list at end of paper.

Unfortunately both Blake and Mitchell misinterpreted the most complicated part of the eastern rim of Mount Sdom: they considered that the anticlinal rim of the Pliocene clay-beds, where it stands vertical against the salt, underlay the Usdum series.

THE LAWS OF SOLUTION

Salt bodies are dissolved by underground water (subterranean solution or 'subrosion'), by sea water (subaquatic solution), or by water running on the surface (subaerial solution).

(a) *Subrosion:* As groundwater dissolves the salt, it leaves behind the less soluble constituents of the beds, mainly anhydrates, which form a residual 'caprock'. The contact of this caprock with the salt below is mostly in the form of a peculiar flat plane called 'salt level.' This flat plane is the result of the influence of the law of gravity working on the salt solutions. The concentrated heavy solutions sink into any depressions on the salt surface while the less concentrated but more active solvents float on top, dissolving any projecting salt parts. Every irregular original surface will thus be levelled, with only insoluble intercalations protruding.

As the solution of the salt proceeds downwards, the salt level and the formation of caprock keep pace with it. Any overlying rock formations are thus undermined and may collapse, causing blocks to intrude into the caprock, which becomes breccious in appearance.

The residual caprock covering the salt may also be layered. Goldmann has explained this layering as caused by a 'catatectic' movement of the salt, meaning that the solution process of the salt and the settling of the caprock are rhythmic features forming a layered habitus of the caprock-anhydrite, the lowest layer being the youngest.

Another important feature of the salt level is the occurrence of 'pseudo-step' faults which are formed wherever the sinking of the salt level does not proceed at the same rate in all places, or does not continue over the same period. In these cases the different sections of the salt level do not remain at the same relative height, but break apart into different levels, one next to the other (fig. 4). It should be expected that the lowest 'fault'

steps will be found on the margins of a salt mass, for during the uplift of the mass, the margins will, of course, remain longest below the water table, giving a longer time for the groundwater to dissolve the salt and for the salt levels to sink.

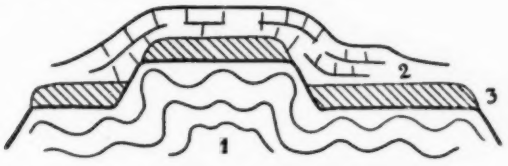

Fig. 4. *Steps* in salt level.

1: Salt 2: Overlying rocks 3: Caprock

Perhaps it should be stressed again that salt level and caprock are formed only below the groundwater level.

(b) *Subaerial solution:* As soon as the caprock and salt level rise above the groundwater level they are subject to the action of running water. In the usual climate, of course, the levelling forces of water on the salt are so great that even the strong tendency of salt-masses to rise, cannot keep pace with them. Under the right conditions of aridity, however, the running water will behave as it does in dissolving other types of rock formations, forming caves, solution channels, karrens, sink-holes, and other features of 'Karst' topography.

THE EFFECTS OF SOLUTION ON THE SALT OF MOUNT SDOM

All the features caused by solution mentioned in the preceding section are easily recognizable in Mount Sdom.

(a) *Subrosion:* The salt of Mount Sdom is covered by a thick anhydrite caprock wherever exposed. This caprock is often breccious, containing slumped blocks of the Usdum series, tumbled down by the undermining effects of subrosion. Other parts of the caprock show 'catatectic' banding. The contact between the salt and the caprock is an exceedingly sharp, completely flat plane or salt level which is broken into steps. The lower steps

occur on the margins of the mountain, the higher on the main ridge. It is interesting to see how the superincumbent Lisan marls did not always collapse after subrosion, but simply sank down together with the caprock. The high and low outcrops of Lisan marl adjacent to one another, look

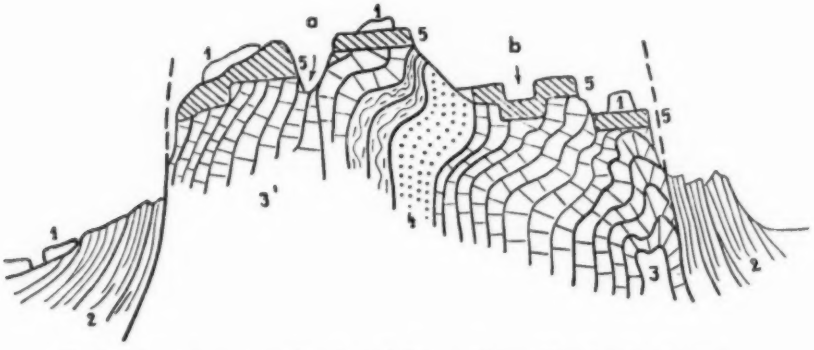

Fig. 5. Schematic cross section through Mount Sdom with subrosion features.

1: Lisan marl 2: Pliocene clay 3: Lower salt
3': Upper salt 4: Usdum series 5: Caprock
a: Sink-hole in upper salt b: *Subsequent* valley in caprock

like faulted blocks: in fact, however, the outcrops lie on different steps of caprock which have sunk at different rates, with no fault existing in the salt below.

Air photos of the southern half of Mount Sdom reveal concentric rings which on first appearance resemble subsequent valleys in the caprock, parallel to the strike of the salt far below. Such a feature, however, should be attributed to the faster sinking of the salt level along salt-beds which were more susceptible to solution than others. It would have been impossible, of course, for a subaerial stream of water to feel the strike of salt-beds lying below 40 metres of caprock. In any case there are younger consequent cañons which cut arbitrarily through the depressed lines. These rings must therefore be old features which were formed when the salt was still below groundwater level.

The caprock and its contact with the salt of Mount Sdom have been misinterpreted by several geologists. Mitchell, for example, calls the salt level at one place an unconformity, at another, a thrust plane. He presents many good photos with his explanations, so that his conceptions can be checked. Blake seems to follow Mitchell rather closely, though he expresses himself less clearly.

(b) *Subaerial solution:* A most obvious feature of Mount Sdom is its subaerial solution which is expressed in karrens, sink-holes, funnels, long winding caves, stalagmites and stalactites.

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The Excavations at Tell Qasîle

Preliminary Report*

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Hebrew University, Jerusalem

STRATUM IX was pretty poor in pottery and other finds. Among the jugs and jars, specimens with a red slip and decorated with black bands stand out, some of which have a close and rather rough burnish. A fragment burnished over a white slip (6019), found in stratum IX, 2, is apparently of Cypriot origin. The store-jars have a rounded rim, a sharp shoulder, and two handles reaching from the shoulder to the body; usually the base is rounded (see fig. 8). In stratum IX, 1 we find already the Israelite hole-mouth jar with the flanged rim (No. 6320), and juglets with no slip but with a pinched lip. The large and small bowls have either a flanged or an everted rim; they are carinated, and some have a bar handle. Generally, they have a red slip and poor burnish inside and out, concentric burnish also occurs (No. 2439). In stratum IX, 1 we find the large deep bowl with a flanged rim, a red slip both inside and out, with rough concentric burnish. The bowl found in stratum IX, 2 (No. 7373) seems to be of Cypriot origin; its fine clay is pink, it has a slip, is burnished, and decorated with black bands on the rim and on both sides of the flattened handle. The lamps of this stratum are flat, their rim slightly grooved and their lip pinched. It should be noted that the deep bowls and cups, typical of the post Philistine stratum (X), are not found in stratum IX.

To stratum IX may be attributed the range of destroyed graves, cut in the Kurkar south-west of the tell (see above p. 66), in which were found, besides the remains of the skeletons, some pottery, e.g., a juglet, the body and base of which are rounded, the neck elongated with a rib in its middle

* Concluded from *Israel Exploration Journal*, Vol. 1, No. 2, pp. 61-76, and No. 3, pp. 125-140.

from which a loop-handle reaches down to the shoulder; a small bowl with a red slip, burnished inside and out; a small Cypriot jar, the clay of which is pink, well fired and well levigated; its flattened handle reaches from the rim to the shoulder upon which there is black decoration in the form of a ladder; the rim has bands, the neck has zigzags, and the body has parallel bands, all in black.[23] On the whole, the pottery of stratum IX is similar to that of stratum III at Tell Abu Hawam, of stratum V at Megiddo, of stratum IIa at Beth Shemesh, and of stratum B3 at Beit Mirsim. In stratum IX a small number of bronze and iron objects was found, such as an iron knife-blade (No. 2913) with two bronze rivets in it for the attachment of the handle, a sickle blade (No. 5565), and a fragment of a bronze armour-scale, typical of the Iron Age, found in room K4.[24]

Study of the archaeological evidence in stratum IX shows that, after the destruction of the foreign town, the Israelite settlers proceeded to build on its ruins, in accordance with a new plan, a new settlement very much reduced in size and rather poor in cultural possessions. To stratum IX, 2 belongs only the complex of structures J-K in the south of the excavated area. In the second stage of this period (IX, 1) the settlement had grown, and was surrounded by a city wall of undressed stone, while near the summit of the hill, east of the houses J and K, the public building L was erected. It becomes clear, therefore, that already in this period the site was used as an administrative centre and may have been one of the treasure-cities of the Israelite coastal district. Chronologically, we may apparently attribute stratum IX, 2 to the days of King David and to the early days of King Solomon; and stratum IX, 1 to the main part of King Solomon's reign.

7. THE PERIOD OF THE KINGS OF ISRAEL (STRATA VIII AND VII)

The burnt layer separating stratum VIII from IX in the buildings J and K is proof of the settlement's destruction which apparently took place in

[23] Compare the jar (stratum VA) Loud, *op. cit.* (supra, n. 13), Pl. 89, 7.

[24] Compare Petrie, W. M. Flinders: *Tools and Weapons.* London, 1917. Pl. XLII, 103-128. p. 38. Lamon & Shipton, *op. cit.* (supra, n. 18), Pl. 85, 1-10.

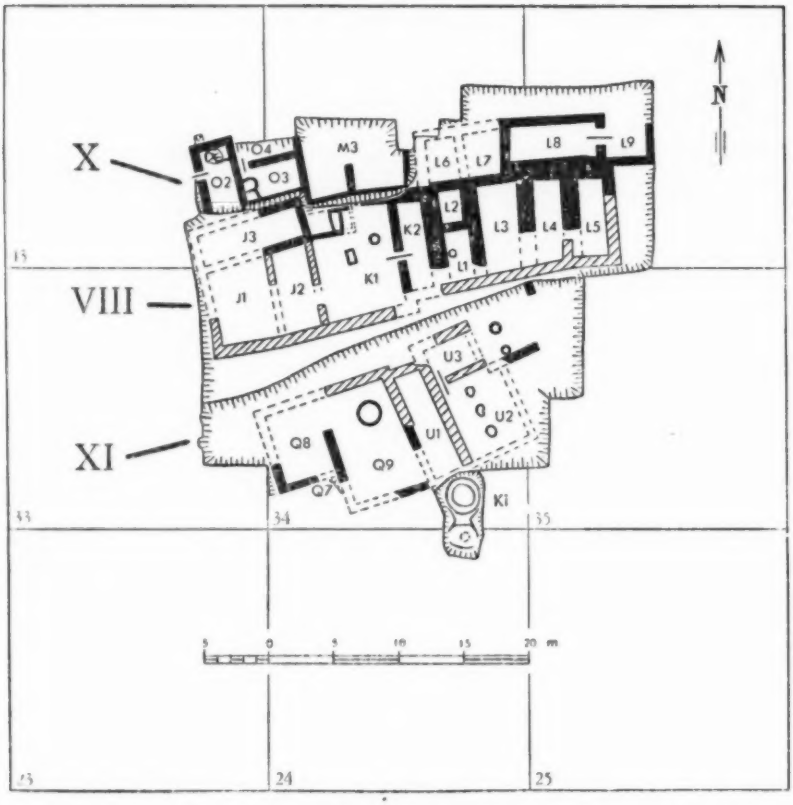


Fig. 9. Enlargement of southern area of excavation shown in fig. 1, p. 64, showing exposed parts of strata XI (rooms Q 7-9, U 1-3), X (O 2-4, M 3), and VIII (J 1-3, K 1-2, L 1-9).
The Late Roman pottery kiln (stratum III) is shown as Ki near the south-east corner of square 34 (cf. p. 217).

the third part of the 10th century B.C. A layer of dust and ashes covered all the small structures in the courts of the houses J and K mentioned above, as well as the cells and the jars in room K 4, all in stratum IX, 1. The settlers, however, used the foundations of these houses for the construction of new ones, raising the pavements to a higher level (by 30 to 40 cms.) in accordance with the old plan. In the court of house

J (J 1) which was then built of Kurkar rubble, the foundations of the pillars were covered up, thus swallowing completely the western room. The house now contained the oblong room J 2 east of the court J 1, both being bounded on the north by the oblong room J 3. No change occurred in the plan of house K which also contained at that time (stratum VIII) one oblong room (K 2; but this had no cells in it) and, to the west of it, the court K 1 (fig. 9). In this court three brick cells were found, one near the other, against the northern wall, and an additional, oblong, cell in the middle of the court, the purpose of which is not clear. Where the baking oven had stood in stratum IX a new one was built, and close to it, near the eastern wall of the court, about 80 loom-weights or clay heaters (?) were found, and near them a deep bowl (fig. 10 d) buried under a thick layer of soot. This find, as well as the quantity of 'loom weights' in stratum VII (see fig. 2, H 2), may suggest the existence of heating places, used for keeping food warm. In the court K 1 various household objects were also found, such as mortars, pestles, jugs, jars for drawing water, and the like, as well as two whole mud bricks (12 x 35 x 62 cms.) from the building, partly burnt.

East of house K the remains of the public building L were found, which, as already mentioned, went through different stages of development and extension, reaching its final form in stratum VIII (fig. 11, Pl. 29 A). It was constructed of bricks averaging 70 to 80 x 40 cms., except for the southern wall and part of the eastern wall which were of Kurkar rubble in their last stage.

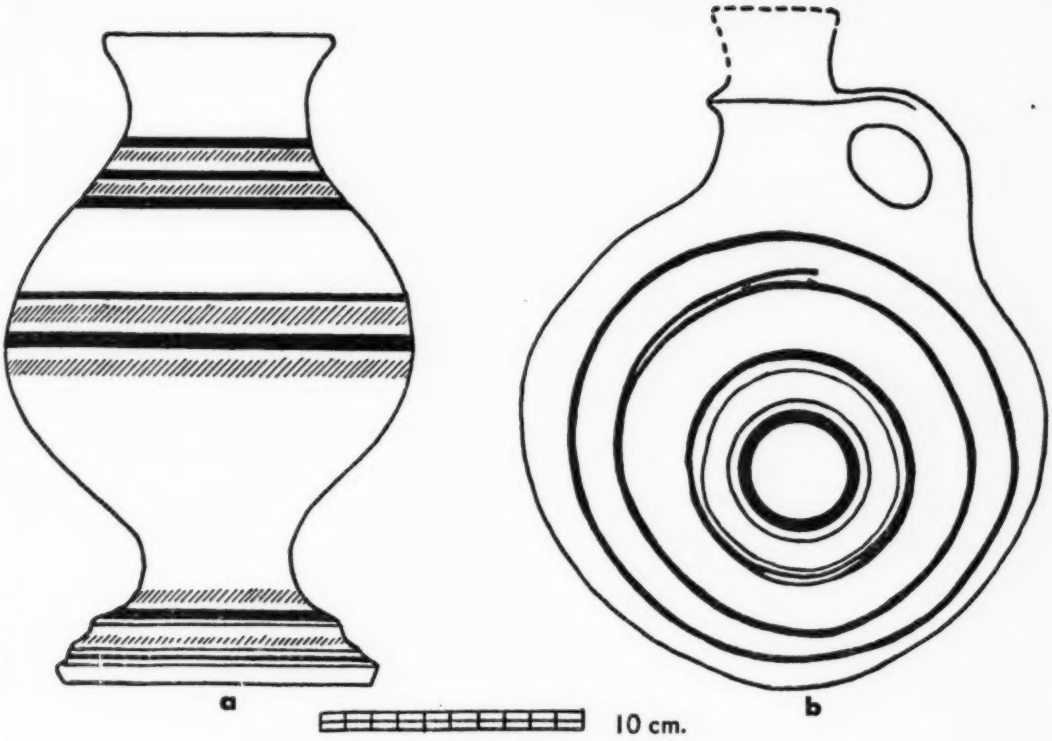
The building extends over some 200 square m. and contains nine rooms: four front rooms (L 6-9) on the north side, which were built, as mentioned above, in the former period, with the additional oblong rooms (L 1-5) on the south (see fig. 11): the south-west room is really an oblong room divided by a partition into two parts (L 1 and L 2). It should be noted that in the northern complex of rooms (L 6-9) the floors were raised by about 65 cms. (in relation to stratum IX, 1) up to about 24 metres above sea level, using the débris of the ruins of the abandoned areas, north of the Israelite structures, as filling; this filling contained potsherds belonging

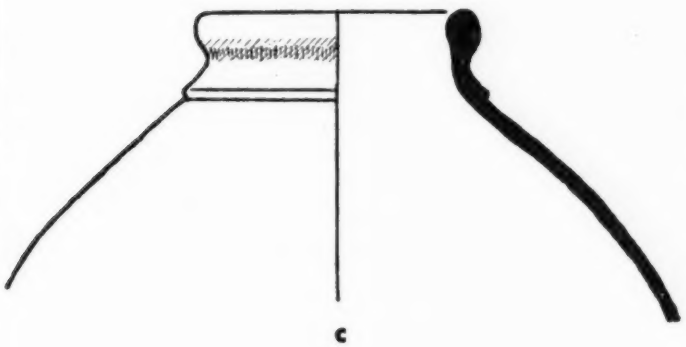
to strata X-XII. It appears that building L had an upper storey, judging not only by the steps in room L 8 (see above p. 140, Pl. 29 A) but also by the double party-walls within the building. There seems, therefore, to be no doubt that this was a public building, and it may have been the government offices.

Its plan somewhat resembles house 1482 of stratum IVb at Megiddo, which continued to be used even in the next period (stratum IV) and which, according to Lamon and Shipton, 'probably contained administrative offices and living-quarters' attached to the governor's palace.[25] In our building L several objects were found which testify to its public character, such as seals, a bone graver, some good pottery and a bronze spear-head, but no household objects were found except four jars stuck in the floors in the southern end of rooms L 3 and L 4, and supported by stone structures.

Public building L in its final form, as well as the living-quarters west of it, belonging to stratum VIII, did not last long. Apparently the site was abandoned, for reasons unknown to us, and on its ruins a new settlement was built later (stratum VII). On the site of public building L we find, in stratum VII, living-quarters built of brick, the orientation of their walls being different from that of the building in stratum VIII (fig. 2). House H contains a courtyard H 2 in which there were a baking oven and a collection of clay heaters (or 'loom weights') near its north-east corner, and east of the courtyard an oblong room H 3 in the north part of which was found a store-room divided into four cells containing pottery (see Pl. 34 E and fig. 2). We may assume, therefore, that this house was built according to the plan traditional at Tell Qasîle in the Israelite Period. More to the north, a spacious courtyard was unearthed, belonging apparently to a large house (I); in the middle of it a baking oven and two stone pillar-bases were uncovered. As for the area in the western part of house H, and as far west as the destruction-line caused by the levelling done during the Persian Period (see above, p. 69), remains of floors be-

[25] Lamon & Shipton, *op. cit.* (supra, n. 18), p. 10, fig. 12, p. 22 ff. Compare also the plan of the Palace in Hadeta (Arslan Tash), Thureau-Dangin, F.: *Arslan-Tash*. Paris, 1931, plan. Parrot, A.: *Archéologie mésopotamienne, les étapes*. Paris, 1946, p. 466, fig. 128.





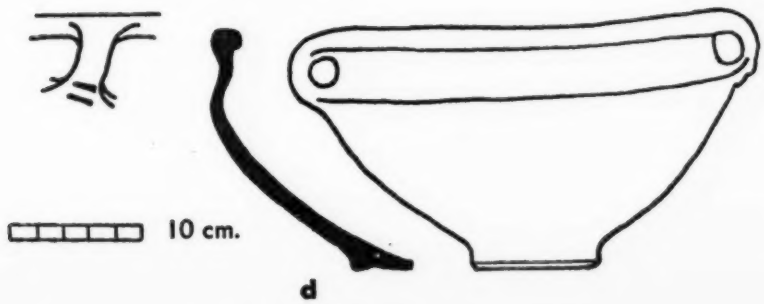


Fig. 10.

a, b: decorated pottery from stratum VII.

c: fragment of wine-jar from stratum VIII (1 : 5).

d: bowl from stratum VIII.

longing to two store-rooms (?) were revealed, one just south-east of peg 44b3 in which spot, at a level of 24.60 m., were found fragments of four jars lying in a straight line, one near the other (for one of them see fig. 12f), and close to them wine-jar stoppers with broken pottery; the second, just west of peg 44b4, also at level 24.60 m., where a lot of clay 'heaters' and pottery were found: more 'heaters' and a pot were found just south-west of peg 44c3, at the lower level of 24.35 m. (see fig. 9).

As mentioned above (p. 69), the floor-levels, baking ovens and store-places confirm the existence of two different stages in stratum VII (see fig. 2), and it becomes clear that this settlement existed for quite a long time.

As in the excavated area in the south of the tell, so in the fortification area in the west, we were able to distinguish between the three strata IX, VIII and VII by making an examination of the levels of the foundations and of the floors, and of the relation between the stages of the structures. The examination of the rubble parts of the structure which were uncovered in the second season has proved it to be nothing but the foundations of a casemate wall, erected (stage A) at an earlier Israelite period, apparently in stratum IX, 1: after its destruction, it was rebuilt (stage B) in stratum VIII, and was later repaired once more (stage C) at the end of the Israelite Period (stratum VII).

We followed this wall on the western slope of the hill for a total length of 45 m. Since we had not removed the remains of the two later stages (B and C), only a few remains of the first stage (A) were uncovered, traces occurring in squares 70 and 51 (fig. 1, p. 64). It is, therefore, impossible to give the complete plan of the early city wall. On the other hand, a substantial section—about 35 m. long—of the inside of the casemate wall together with its cells was uncovered which belongs to the two late stages of the structure (B and C in strata VIII and VII). On the northern part of this section there were remains of a small tower, in which we were able to distinguish clearly both stages, B and C (see Pl. 34 D). The tower was divided by an inner wall into two cells, in one of which was found a baking oven. As for the city wall itself, notwithstanding its varied processes of development and repair, its plan can be made out, especially in its last

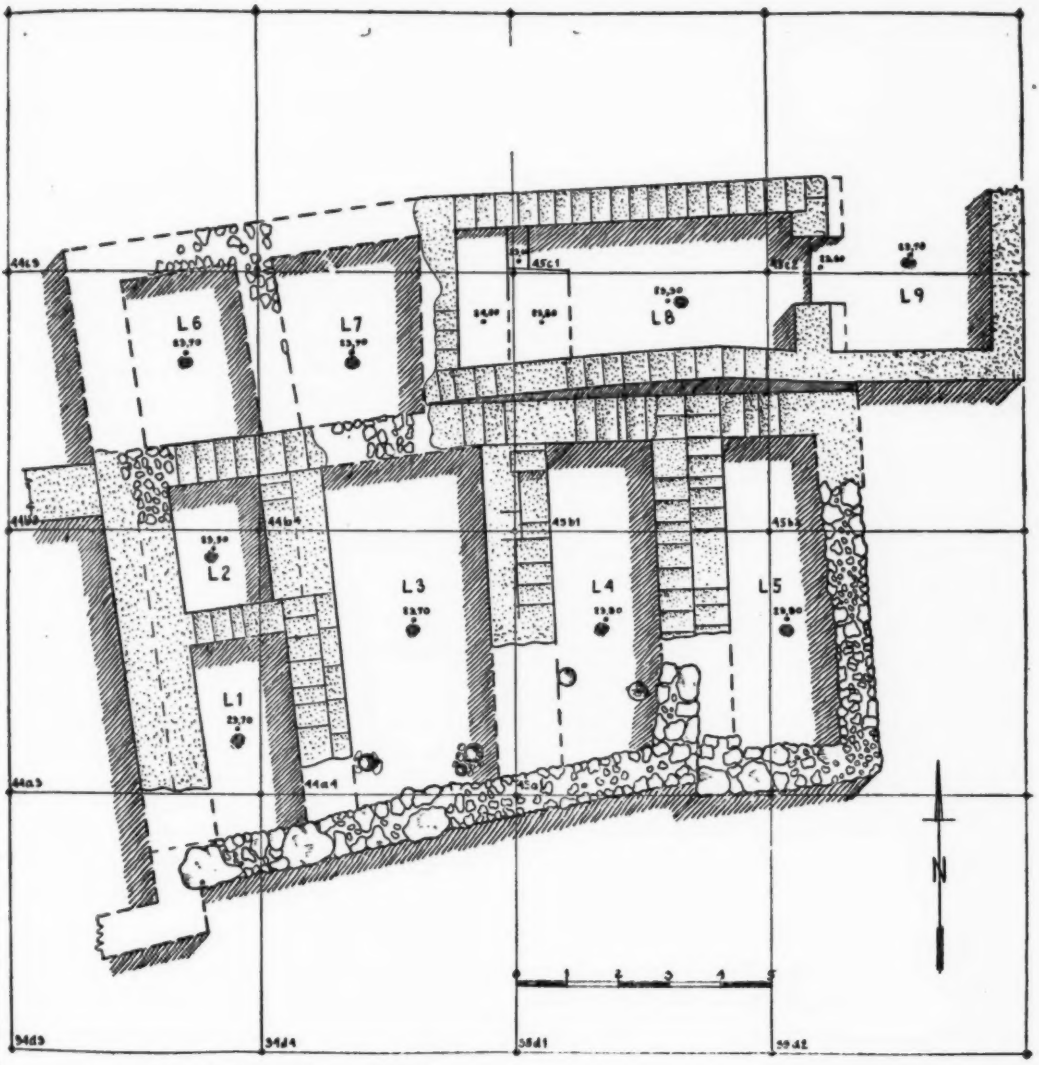


Fig. 11. Public building L (stratum VIII).

stage (C); its average thickness is 6.5 m., and its parallel cells are small oblong rooms (1.5 x 5—2.5 x 5 m.) built crossways. One of the cells (square 61b2) served as a store-room for wine and oil vessels and also for other objects, such as the jar which has a drawing of a galloping horse on it (Pl. 34 C). In two other cells (stage B) granaries built of Kurkar rubble were found. The pottery and the moulded lion-head, apparently part

of a brazier or incense burner (Pl. 35 B) belonging to the Israelite Period, were found in the city wall area.

A casemate wall, greatly resembling that at Tell Qasîle, in which the oblong cells are also built one near the other, crossways, surrounded the King's palace at Samaria in 'Omri's reign and continued to be used even in Jehu's time[26]. Surely this similarity cannot be accidental, and one may well assume that the architects of Tell Qasîle built the fortifications in the style accepted throughout the Kingdom of Israel in general, and particularly in the capital.

The pottery found in strata VIII and VII is on the whole typical of Middle Iron Age I, but one finds also specimens which are altogether different. In stratum VIII we find the long-necked jars with double handles emerging from the centre of the shoulder, and with a ring base: they have a red slip, and are burnished. The juglet in fig. 12 a and Pl. 35 C, No. 1, with a red slip, is burnished, and decorated with horizontal bands of reddish-brown and white. Four jugs belonging to stratum VIII are given in Pl. 35 C, Nos. 2-5 (No. 3 has a red slip and concentric burnishing). To this stratum belongs also the jug with a slip, which has a strainer-spout on the upper part of its body: it is typical of the period under discussion.[27] Another jug (fig. 10 b), also with a reddish slip and burnished, has a decoration of brown concentric circles with white filling in between them. Both strata have the typical wheel-burnished jugs and juglets. In stratum VIII we find the usual jars with thickened rim, narrow neck and ring base. Hole-mouth jars which first appear in stratum IX are found also in stratum VIII. Here, for the first time appears the burnished oil-jar which has, on its shoulder, a small cup with a drain-hole, for holding a juglet, typical of the Middle Iron Age.[28]

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[26] See Crowfoot, J. W. & Kenyon, K. M.: *The Buildings at Samaria*. London, 1942, Pl. VIII. and Sukenik, E. L.: The gates of Shomron. *Qedem*, 2, 1945, p. 60. About fortification methods, common in the Kingdom of Judah, including the ancient casemate walls in Beit Mirsim and Beth Shems, see Albright, *op. cit.* (supra, n. 10), p. 12 ff.

[27] Lamon & Shipton, *op. cit.* (supra, n. 18), Pl. 3, 75-77; Pl. 45, 75 (stratum VI) as well as Albright, *op. cit.* (supra, n. 14), Pl. 70, 13.

[28] Albright, *op. cit.* (supra, n. 14), p. 80, Pl. 34, 1-3.

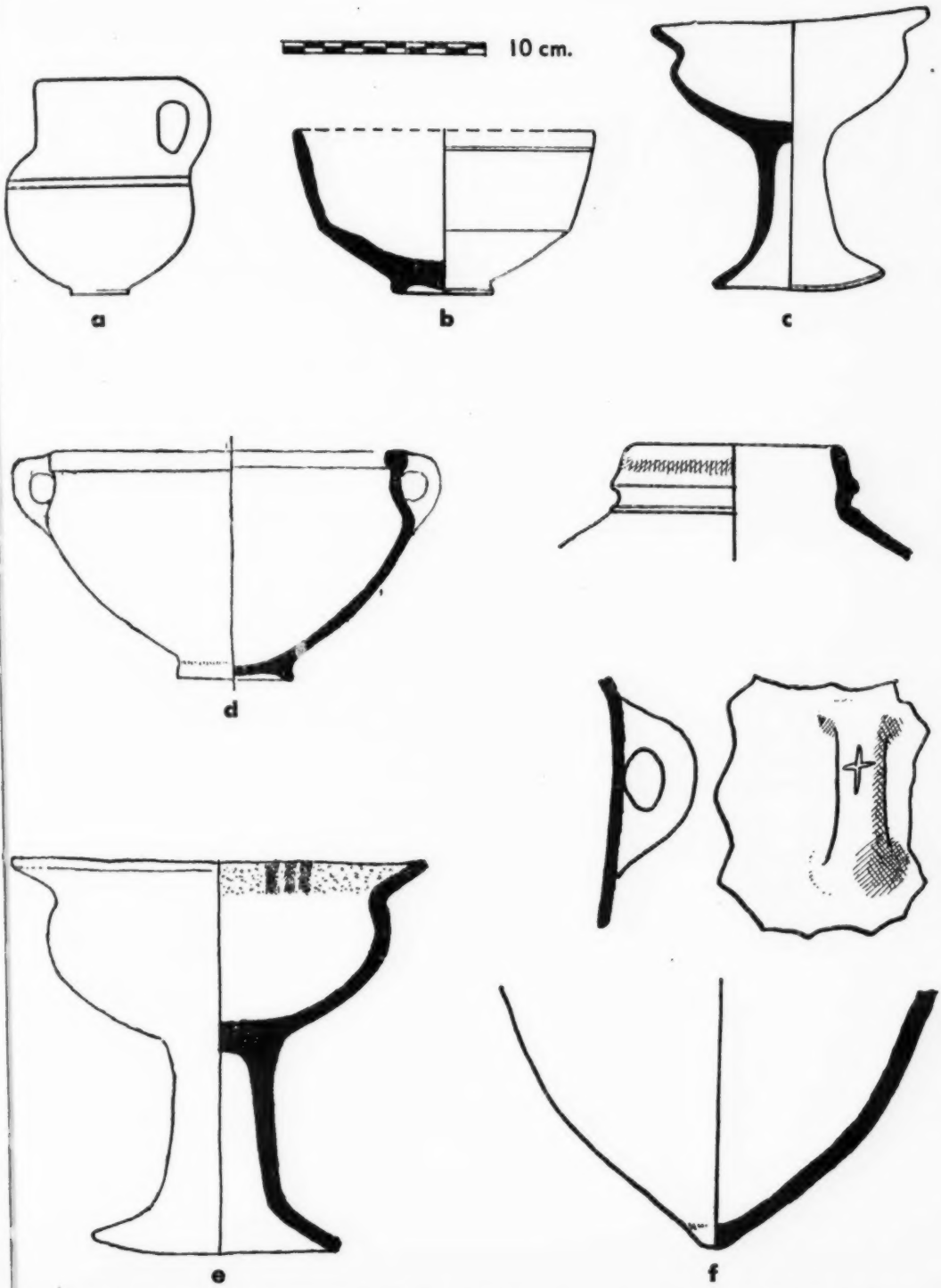
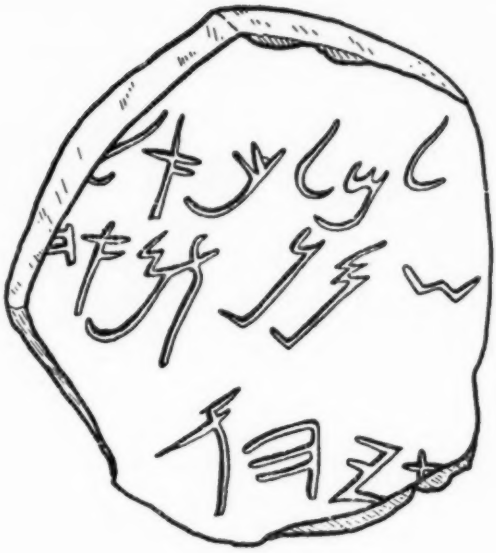
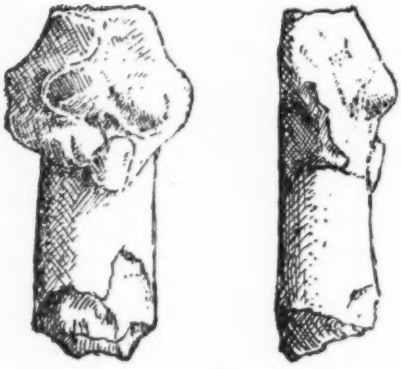


Fig. 12. Pottery from the Israelite Period. a, b: jug and bowl, stratum VIII. c: chalice, stratum IX, 1. d: bowl, stratum VII (1:5). e: chalice, stratum VII (2:5). f: fragments of wine-jar, stratum VII (1:5).

a



b



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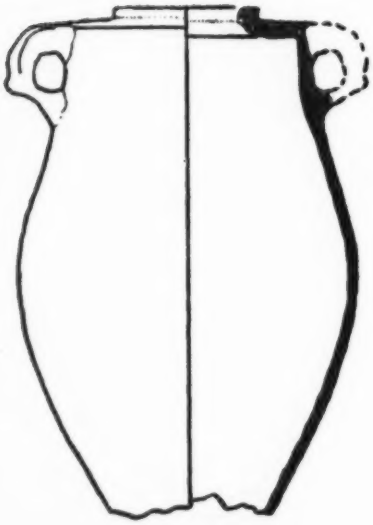

e

f

Fig. 13. a: scaraboid seal (obverse) from building L, stratum VIII. (Scale 4 : 1). See also Pl. 37 B. b: ostracon No. 1. Surface find. (1 : 1). See also Pl. 37 A. c: fragment of 'Pillar Astarte', stratum VIII. (1 : 2). d: bowl from stratum VI (1 : 5). e: jar from stratum VI (1 : 5). f: ostracon No. 2. Surface find. (1 : 1). See also Pl. 38 A.

Among the jars of stratum VII, worthy of note are the fine specimen (fig. 10 a), decorated with horizontal red and brown bands, and the jar with two loop-handles and a ring base (Pl. 34 C), found among other vessels (such as the jar in Pl. 35 A) in one of the cells of the casemate wall. That jar is made of light brown clay and has a red slip shading gradually into brown; it is well burnished, except in one place in which is drawn, in yellowish colour, a galloping horse with some unclear object in front of it; below and in front of the horse there is a grid design in black. Among the store-jars, two should be especially mentioned; one from stratum VIII (fig. 10 c) and the other from stratum VII (fig. 12 f), the distinguishing trait of which is the collar rim:[29] close to the second one were found conical stoppers for wine-jars. The juglets of stratum VIII have a pinched lip, and a rounded or somewhat pointed base; one of the juglets made of fine clay has a red slip and is brightly burnished (No. 1590): it appears to be of foreign manufacture. A flask (No. 6304) and a small bowl (No. 1464) may also be imported (from Cyprus?).

The large bowls, the small bowls and the cooking-pots have many shapes and are generally carinated. They were found in strata VIII and VII, some having a red or brown slip, and they usually have concentric burnishing, finely done. Among the large and small bowls one usually finds the wheel-burnish, typical of the Middle Iron Age, which is a common type found in the early stage of this stratum (see Pl. 36 A: Nos. 1-6 from stratum VIII, and Nos. 7-14 from stratum VII).[30] It should be noted, however, that the bowls of the strata under discussion have the typical horizontal bar-handle. Of special interest is bowl No. 1155, the fine clay of which is yellowish green; it has a dark brown slip and fine wheel-burnishing. There is also the small white 'Cypriot' bowl (No. 7880) which is decorated with light brown bands: both of these belong to stratum VIII. Many of the large and small bowls resemble the common type found at Megiddo in stratum VII.

[29] The period of this type of jars in the Iron Age is not clear, but see Wampler, J. C. in McCown, C. C.: *Tell En-Nasbeh, II.* Berkeley, 1947, p. 4.

[30] Albright, *op. cit.* (supra, n. 10), Pl. 72 B.

Some isolated fragments of bowls, of the kind called Samarian pottery, which are highly burnished, were found in the two strata under discussion: No. 1273 of ivory colour found in the first season, and No. 1356 in red, both belonging to stratum VIII; the rest of the pottery was found in stratum VII or in the Persian fosse. Interesting also are the deep bowls with the double loop-handles and flanged rim belonging to strata VIII (fig. 10 d) and VII (fig. 12 d) which are usually covered with a red slip and concentric burnishing, sometimes rather well done; one also finds deep bowls with four loop-handles, and a red slip, some of which are burnished. Among the cooking pots of the earlier type, there stand out those with a narrow mouth and a fluted collar round the rim, from which the handles reach down to the shoulder. The lamps have a more sloping rim than in the previous period, but the base is not yet in evidence. The chalices retain their old tradition; the flaring rim sometimes shows a coloured band design (fig. 12 e from stratum VII). On occasion, the bowl of the chalice has a hole through it into the hollow stem. Among the other objects one should mention mainly the fragments of a clay Astarte figurine, of the type known as the Pillar Astarte (fig. 13 c), typical of the period of the Israelite Kingdom.[31] Two seals were found in the public building L in stratum VIII. On one of them, a scarab, (Pl. 37 B and fig. 13 a) the figure of a man is engraved standing in a chariot indicated by a wheel: in one hand there is a whip or sword, and in the other one the ends of two reins; in front of the horse is the figure of a man holding the bridle and, above the horse, a gazelle.[32] On the second seal, figures of animals are engraved and on the back of it a face of negroid type (Pl. 35 D).[33]

Among the few stone weights one is of special interest (Pl. 36 D). It is made of hard limestone, oblong in shape and with a rounded top; from its form and weight (6300 grams) one may say that it is a tenth part of a talent of 3000 shekels, on the assumption that the Hebrew shekel

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[31] Albright, *op. cit.* (supra, n. 10), p. 69 f., Pls. 55-57.

[32] A similar seal of the Early Iron Age was found at Tell Far'a: Petrie, F.: *Beth-Pelet I (Tell Fara)*, London, 1930. Pl. XXXI, 284, and compare there Nos. 310, 304.

[33] About this kind of seal see Hamilton, *op. cit.* (supra. n. 13), p. 63.

weighs 20-21 grams.[34] This weight was found, re-used, in stratum VI. In both strata we found also a few bronze and iron objects, such as a bronze spearhead, bronze needles and iron blades; also millstones and scales of sea-turtle as well as other objects.

Study of the archaeological evidence in strata VIII and VII has enabled us to date them to the ninth and eighth centuries B.C. Various parallels in structure and in pottery are found in strata IV B and IV at Megiddo and in the Israelite strata at Samaria, and some of the typical objects are found in stratum III at Tell Abu Hawam, at the fortress of Tell el Kudadi, as well as in stratum A1 at Tell Beit Mirsim; and in stratum II (especially in IIb) at Beth Shemesh. But it is clear that the fortifications, the buildings and the pottery testify to the close relations maintained by this settlement with the cultural centres of the Kingdom of Israel (but not with the Kingdom of Judah). It should also be pointed out that in the earlier stage of the period under discussion (stratum VIII) the settlement had reached a high standard of prosperity and had become the administrative centre, as witnessed by the casemate wall and the public building L. But while it is true that in the later stage (stratum VII) remains of the casemate wall were preserved, the public building site was only used for living quarters. In the light of the archaeological evidence, we can attribute stratum VIII to the first half and the middle of the ninth century (the time of the House of 'Omri) and the two stages of stratum VII to the end of the ninth and to the eighth centuries B.C. (the time of the House of Jehu). As for the dating of the destruction of the Israelite town, the year 732 B.C. may be plausible, the time when the armies of Tiglath Pileser III overran the northern and western districts of the Kingdom of Israel, reaching as far as Rishpon by the sea, and even to the river Yarkon, the border line of the Kingdom of Israel towards Philistia.[35]

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[34] Reifenberg, A.: The legend 'Shekel' on a Hebrew weight. *Bull. Isr. Explor. Soc.*, 15, 1950, p.70.

[35] Maisler, A.: The expedition of Tiglath Pileser III to Palestine in 732 B.C. *Bull. Jew. Palest. Explor. Soc.*, 1, 1933, pp. 1-6.

8. THE HEBREW INSCRIPTIONS

Two ostraca were found on the surface of the south-western part of Tell Qasîle before the beginning of the excavations: the first (No. 1) was found in October 1945 by Mr. and Mrs. Y. Kaplan, the other (No. 2) in May 1946 by Dr. R. Hoff. The type of the sherds as well as the palaeographic examination permits their attribution to the end of the Israelite Period in Tell Qasîle, i. e., to stratum VII.

Ostracon No. 1: The inscription is deeply carved on the inside of a ring base which has a reddish slip. The inscription is in the cursive Hebrew script used in Israel and Judah in the eighth century B. C., and it might be considered as transitional between the writing of the Samarian sherds and that of the Siloam inscription. On the whole, each letter is written separately, but signs of linking the letters appear in ומ in the second line. The ostracon was damaged only on its edges. The following is the wording of the inscription (fig. 13 b, Pl. 37 A):

1. למלכאל [...
2. שמנ ומאה
3. חיהו

In line 1, one should read: .... למלכ אל as two separate words, and not as one word, למלכאל. Therefore, the following reconstruction might be acceptable: [ם]למלכ אל, i. e., 'for the King 1000 (log of) oil', etc.

There arises a doubt as to the last letter of the second word in line 2 (ומאה), since the third horizontal stroke of the letter ה is missing.

In line 3 the letters יהו, YHW, are clear. and the damaged letter before them is, no doubt, ח. We have therefore the name חיהו, ḤYHW, an abbreviation of the Israelite name אחיהו, 'ḤYHW, like חיאל, חימן, חיים, חימלך, —Ḥiel Ḥiman, Ḥiyam, Ḥimelekh.[36] In the light of this assumption one may complete the inscription in the following way:

למלך, אל[ף] שמן ומאה, חיהו.
(For the King one thousand and one hundred [log of] oil... Ḥiyahu.)

[36] Kutsher, J.: Two Hebrew Seals. *Qedem*, 1, 1942, pp. 44-45.

This appears to be a bill for a certain quantity of oil, sent from the king's treasure stores[37] to one of the coastal towns in Phoenicia[38] or in Egypt,[39] by the Israelite official Hiyahu who may have been the inspector of exports from the store houses and the harbour at Tell Qasîle.

In the inscription no special definition is given as to the liquid measure, and it is not improbable that the smallest measure was intended, such as the *log*, and not the large measure such as the *bat* (about 22 litres).[40]

Ostracon No. 2: The inscription is carved on a sherd of a large pot, the clay of which is light grey. The writing shows signs of a ready pen, obviously the work of a quick scribe who, at speed, had a tendency to join the letters. One should mention the points separating the words which do not appear in ostracon No. 1. The following is the text of the inscription (fig. 13 f, Pl. 38 A).

1. זהב . אפר . לבית חרן.
2. ש ≡

The letter ז, zayin, at the beginning of the first line, is very clear although only traces of it have been preserved. The point after the words לבית חרן and the vertical stroke after the point are signs of an additional word which comes at the end of the first line.

In the Bible gold of Ophir, זהב אופיר, is interpreted as a special kind of gold of excellent quality, whose name is derived from the land of its origin—Ophir. The quantity of the gold is mentioned in line 2. There is no doubt that the letter ש is nothing but an abbreviation of the word 'shekel', similar to that found in the Papyri of Elephantine of the fifth century B.C.[41] The three parallel horizontal lines denote the number of shekels, i. e. 30, in the same way as in the numbering system given in the

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[37] Compare 1. Chronicles, xxvii, 28; 2 Chronicles, xxxii, 28.

[38] See Ezekiel, xxvii, 17; 1 Kings, v, 8; 2 Chronicles, ii, 15.

[39] Hosea, xii, 2; and see Ben-Dor, I.: Trade Relations between Palestine and Egypt in the Canaanite Period, in *Trade, Industry and Crafts in ancient Palestine*, Jew. Palest Explor. Soc., Library of Palestinology, IX-X, Jerusalem, 1937, pp. 31-50, Ref. p. 36-7.

[40] See Albright, *op. cit.* (supra, n. 10), p. 58-9, n. 7, about liquid measures.

[41] Cowley, A.: *Aramic Papyri of the Fifth Century B.C.* Oxford, 1923, index page 311, and especially No. 22 (Cowley p. 66 d).

Phoenician and Shemal (Sinjerli)[42] inscriptions. We should, therefore, read the inscription thus:

זהב אופיר לבית חרן ... שקלים שלושים

(Gold of Ophir to Beth Horon... thirty shekels)

Evidently, this is an official document certifying the dispatch of 30 shekels (half a maneh) of gold of Ophir to Beth Horon.

In the name Beth Horon, the word 'Beth', written in the construct, is spelt in full—which is the common use in inscriptions of the eighth to sixth centuries such as the Lachish inscriptions, the intention being apparently to designate the twin town of Beth Horon (Upper and Lower), known to us as the Levitical city (administrative centre) in the land of Ephraim, and as a treasure city in the days of Solomon, an important fortification on the road leading from the Shephelah to the mountains (the Beth Horon Road) situated on the border of the Kingdom of Israel towards Judah.[43] This assumption is confirmed also by the spelling of Beth Horon (cf. 1 Kings, ix, 17). It is, however, possible that the inscription alludes to the house (temple) of the great Canaanite god Horon, the more so as in the Greek Delos inscription of the second century B. C. Auronas is mentioned as the god of Yamnia (Yavneh), whose cult had apparently continued to exist in the coastal part of Israel until the Hellenistic period;[44] this interpretation supports the assumption that in Tell Qasîle or somewhere in its vicinity there existed a temple of the god Horon, worshipped by the Phoenician mariners.

The two inscriptions under discussion bear witness to the importance of the settlement in Tell Qasîle at the end of the Israelite Period (stratum VII) as a centre of import and export in the Kingdom of Israel, the name Hiyahu giving additional proof that the site was Israelite.

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[42] Lidzbarski, M.: *Handbuch der nordsemitischen Epigraphik*. Weimar, 1898. Pl. XLXI. Concerning the system of differentiating different units through different positions of lines cf. Torczyner, H.: *The Lachish Ostraca*. Jerusalem, 1940, p. 206.

[43] See especially Joshua, xxi, 22; 1 Kings, i, 17; 2 Chronicles' viii, 5.

[44] Cf. C. Virolleaud, in *Revue d. Etud. Sémit.*, 1937, p. 39 ff.; and Gray, J.: The Canaanite God Horon, *Journ. Near Eastern Stud.*, 8, 1949, p. 27. Horon is connected with El Rashef, after which the sea town in the vicinity of Tell Qasîle was called (Apollonia-Rishpon).

9. THE PERSIAN PERIOD

THE RETURN OF THE EXILES TO ZION (STRATUM VI)

As mentioned above (p. 69), stratum VI is represented only by a single building—building G—which was built of Kurkar rubble upon levelled ground in the west of the excavated area in the south of the tell (fig. 2, p. 70). Of this building only the foundations of the north-eastern part were preserved (Plate 37 G); its western part was destroyed by the Roman fosse, and its southern part was either washed down, or else removed by man because it stood visible above the ground.

Nevertheless, it is possible to reconstruct its plan with some certainty by its remains and by comparing it with another building of great similarity, which was uncovered in stratum I at Megiddo (building 736).[45] It contains an inner court with rooms on three of its sides: square rooms in the corners (room G 4, measures 2.5 x 2.4 m.) with oblong ones between them (room G 3 is over 6 m. long). In room G 3 a floor of small Kurkar stones was preserved, 23.80 m. above sea level. Apparently the main entrance to the inner court (G 1) of the building was on the west side. On the east side of the building, a spacious outer court (G 6) was uncovered, containing a granary built of Kurkar rubble. On the floor of the court, which is at 24 m., above MSL, jars and fragments of Persian pots were found covered with ashes (see model in Pl. 39 A). It should also be noted that north of the building we found a ditch which contained a good many Persian pots and sherds, mixed with older pottery.

The pottery of stratum VI is typical of the Persian Period. Similar pottery is found at Tell Abu Hawam, 'Athlit and other tells on the coast, in the Shephelah, and in the hills. Typical is the jar with rounded rim, flat, angular shoulder and handles reaching from the shoulder to the body (fig. 13 e). There were fragments of jars with vertical loop-handles and a large jar of grey and gritty clay; it has a collar-rim with a rib underneath, a cylindrical body and a rounded base. Characteristic are the bowls of yellowish-green clay, with flaring rim, ribbed body and flat base (fig. 13 d), also the bowl (Pl.

[45] Lamon & Shipton, *op. cit.* (supra, n. 18), p. 88, fig. 98, this being the only house in this stratum, the plan of which is clear.

37 D) made of the same clay but with a thickened rim, ribbed body and ring base. Among the other pots mention should be made of the juglet (fig. 14 a), the small bowl (Pl. 37 C) and the lamp (Pl. 37 E), all typical of that period.[46] A few fragments of Attic pottery belonging to the fifth century, were also found, one of which is worthy of note; it was found in stratum VI and it shows dancers in 'black figure technique', belonging to the beginning of the fifth century B. C. (fig. 14 d). The same stratum produced a fragment of a figurine—the 'Persian Horseman' (No. 764), found in the Persian fosse. Among the rest of the finds we shall mention the iron point of a plough (No. 973).

It may be conjectured that the Hebrew seal (Pl. 37 F and fig. 14 f) found by Dr. Hoff at Tell Qasîle on the eve of our first season, belongs to the same period. It is square and made of limestone; on its face a figure of a man is carved with a Hebrew inscription on three sides of it. The whole of it is enclosed within a square border.[47] The man's head is turned to the right and is seen in profile; on his face traces of the beard can be detected; it is questionable whether the man is sitting on a chair or standing up. His right outstretched hand holds a bird (hawk?) reminiscent of the man sitting in a chariot depicted on the Persian coin YHD, or B'LTRZ.[48] When the inscription was being carved, the artist held the seal upside down, so that the man's head was turned downwards. The writing is poor and not uniform, and one could not consider it as the work of a ready scribe (observe in particular the letters in the word MLKH and the letter D in the word 'BD). In view of these considerations, we should date the seal as being later than the ostraca mentioned above: indeed, it seems probable that its belongs to the end of the sixth century or to the beginning of the fifth.

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[46] Compare for example Hamilton, *op. cit.* (supra, n. 13), p. 4.

[47] Compare later seal at Diringer, D.: *Le iscrizioni antico-ebraiche palestinesi*. Firenze, 1934 Pl. XIX, 9.

[48] Sukenik, E. L.: Paralipomena Palaestinensia. *Journ. Palest. Orient. Soc.*, 14, 1934, pp. 178-184. Reifenberg, A.: *Ancient Jewish Coins*. 2nd edit., Jerusalem, 1947, Pl. I. Narkiss, M.: *Coins of Palestine, II, The coinage of the Gentiles*. Jerusalem, 1938, p. 27, fig. 6.

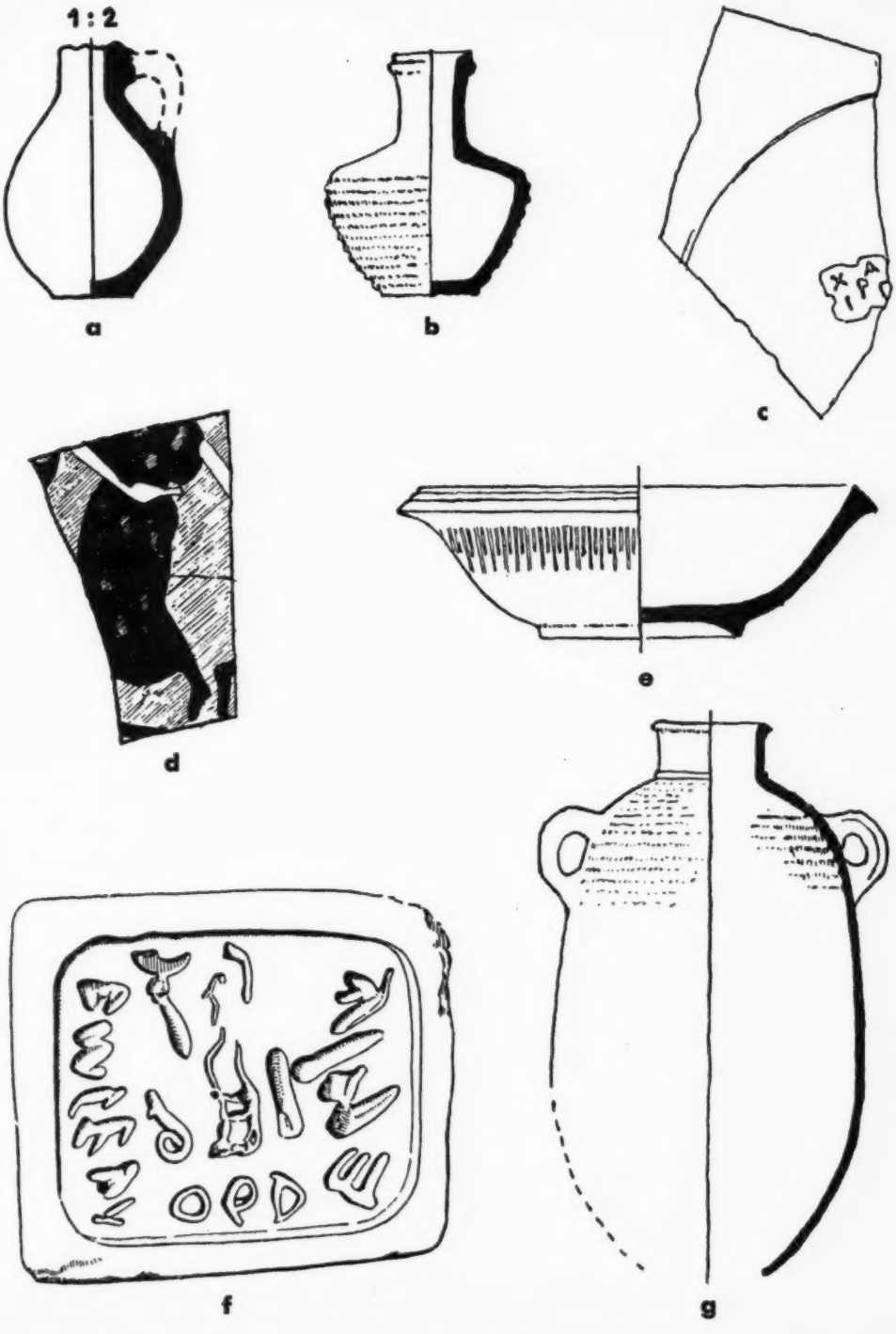

Fig. 14. a: juglet from stratum VI (1 : 2). b: juglet from the Late Roman pottery kiln, stratum III (2 : 5). c: fragments of terra sigillata stamped XAPIC, stratum V (1 : 1). d: Attic sherd, stratum VI (1 : 2). e: rouletted bowl, stratum V (2 : 5). f: Hebrew seal (5 : 2). See also Pl. 37 Fig.: jar from stratum V (1 : 5).

The following is the text of the inscription

עשניהו עבד המלך

('Ashanyahu, servant of the King)

The first letter is blurred, but we might accept the reading as the letter ע, 'ayin. The name of 'Ashanyahu reminds us of 'Ashanel on one of the Hebrew seals.[49] If the assumption that the seal belongs to the first part of the Persian Period is right, two questions arise: (a) the spelling of YHW instead of YH as used in the fifth and fourth centuries B. C. (b) the title *servant of the King*, so common in seals during the time of the First Temple in Israel and Judah, as well as in Philistia. So far no seal of an officer in the service of the Persian Empire has been discovered here in Israel. But it must be noted that the spelling of YH for private names came only gradually into use. And as for *servant of the King*, the title was very common in the Persian Empire (compare Tobiah 'the Ammonite servant'). We might therefore assume that 'Ashanyahu may have been in the royal Persian service as officer in the administration or in the economic department (sea trade) at Tell Qasîle (compare Ezra, iii, 7).

10. THE ROMAN AND BYZANTINE PERIODS (STRATA V-II)

This is a brief account of the archaeological complex of the three Roman strata (V-III) and of the Byzantine stratum (II, 1-2).

Stratum V contains the remains of the Kurkar structure (F) of which some foundations, a few walls, floors and part of a drain were preserved in squares 44 and 45. There were two spacious oblong rooms, F 2 in square 44b2 and F 5 in 44b3, one behind the other, lying east to west, their average sizes being 8.6 x 3.5 m. North of these rooms there was a large court (F 3), and south of them two narrow passages, F 1 and F 4, about 1.5 m. broad. East of F5 a pavement of hewn stones was found (see Pl. 38 C) closed in by a hewn stone balustrade in the north, and by a narrow passage in the south; F 6, being the continuation of passages F 1 and

[49] Diringer, *op. cit.* (supra, n. 47), I.

F 4. Both in its plan and in its style building F resembles the Samarian buildings of Herod's time.[50] The walls, the maximum thickness of which is one metre, are built of two rows of hewn stones, about 50 x 30 cm., arranged with one header alternating with two stretchers in each course; the intervals are filled with grit and earth. The wall foundations, sunk to a substantial depth, are built of small stones and Kurkar chips (Pl. 38 C). At various places, mainly at the junction of the walls separating the rooms F 4-7, there are clear signs of repairs. Part of a drain, penetrating deeply into the former strata, has been found in the area of F 5, and reaches down to the court north of the building (Pl. 40 A).

The date of building F, about whose public character there is no doubt, can be fixed by the style of its construction as well as by its pottery. True, only in isolated places was it possible to examine the remains of the floors of the building (except the pavement in the east), 25.5 m. above sea level, i. e., the surface level of the greater part of the excavated area. Among the potsherds we shall mention especially a few fragments of terra sigillata (see Pl. 38 B; Nos. 1-3) one of which (No. 3) bears the potter's mark XAPIC of Augustus' time (see fig. 14 c).[51] On the other one (No. 2) which is burnished bright red, there is on the inside a double circle of rouletted lines.[52] This stratum contains also fragments of bowls, ribbed cooking pots, jars (see fig. 14 g) and lamps, belonging to the period of Herod and his dynasty. To this stratum we may also attribute the small bowls with a reddish-brown slip and with rouletted decoration, fragments of which were found dispersed on the surface of stratum V (fig. 14 e).

As mentioned above (pp. 68-69) only few remains of structures were preserved belonging to stratum IV. What is interesting in this stratum is the direction of the houses, which lie straight east and west, whereas all the buildings of the previous and later periods have a distinct deviation towards the south. It is not improbable that the settlers of that period

[50] Reisner, G. A. & Fisher, C.: *Harvard Excavations at Samaria, 1908-1910. II.* Cambridge, Mass., 1924, plan 8. Crowfoot & Kenyon, *op. cit.* (supra, n. 26), p. 124, Pl. LXII and plan IX.

[51] Iliffe, J. H.: Sigillata Wares in the Near East. *Quart. Dept. Antiq. Palest.*, 6, 1936, pp. 4-53, Ref. pp. 50-53.

[52] Waagé, F. O.: The Roman and Byzantine Pottery. *Hesperia*, 2, 1933, p. 283, fig. I, No. 54.

removed the ruins in order to erect their buildings in accordance with a new plan. One should also mention the fact that the walls of stratum IV are built of Kurkar stones, with only surface dressing, lying crosswise in the wall. This method can be clearly seen in wall 23, of which two courses of stones were preserved (see Pl. 27 C).

In the second season we were unable to ascertain the relation between strata V and IV, or to fix the date of stratum IV. Only by conjecture did we attribute this stratum to the second and third centuries A. D.

Of great interest is building D which belongs to stratum III, though the only remains left were foundations, drains and traces of walls—and in some places remains of pavements (in rooms D 3-4, 25.65-25.60 m. above sea level). Of this building only its southern part was uncovered to a length of 26.5 m. west to east and about 15 m. north to south. Its central area is occupied by three large oblong rooms, D 2-4, lying north to south. West of these a hall was found, D 1, its length from north to south being at least 13 m. and its width 9.5 m. There are in it three rows of pillars the foundations of which are equally spaced at about 4 m.; the eastern row is attached to the western wall of room D 2.

Parallel to hall D 1 there is another hall, D 5, on the eastern side of oblong room D 4, which contains two rows of pillars, one of which is attached to the eastern wall of room D 4. This plan allows us to assume that it may have been a large trading depot including stores (the oblong rooms).

An interesting fact is worthy of note: the foundations of the walls and pillars penetrate deeply into the strata below (see p. 68), and at the time of their removal it became clear that they had been built according to a special system: upon a layer of sand, which was poured into the foundation trench, layers of stones of different sizes were placed and were held together by lime mortar mixed with chips, while alternating with these layers of masonry there were layers of sand. The construction was solid, and it is not unlikely that the sand layers were meant to protect the building against earthquakes.

In dating building D we base ourselves first on the sequence of the

strata as explained above (pp. 67-68), on the archaeological evidence and, above all, on the ribbed pottery and the pseudo-sigillata fragments which belong to the third and fourth centuries A.D. (Pl. 38 B; Nos. 9-10, 12-16). In strata II and III fragments stamped with the 'jewelled cross' (No. 6), common on Coptic grave stones of the early Christian age, and the 'long cross' (No. 5) were found, both typical of the fourth and fifth centuries A.D.[53]

To the late Roman Period, and apparently also to stratum III, belongs the pottery kiln uncovered at the south end of the tell (see fig. 9). We shall devote a special study to this kiln, but meanwhile we may mention that it is typical of the Roman Period in Europe;[54] its relation to the kilns found in Palestine [55] should be subjected to further examination. Inside the kiln we found the juglet shown in fig. 14 b.

In the Byzantine stratum II we came across two stages, but their remains are rather poor. To stratum II, 1 belongs actually only the wall (thickness 90 cms.) of a building lying north to south which contained two pillar bases for the support of the roof. On the other hand, stratum II, 2 contained only few remains of structures; a pavement of Kurkar chips and a sitting-bath, both uncovered in the middle of the excavated area in the south of the tell. There was also a wine vat in the south-west.

Pottery belonging to this stratum is decidedly Byzantine. The same Byzantine Period contains also a fragment of a Greek ostracon, found in the 'Roman Fosse', which is being studied by Prof. M. Schwabe. Meagre remains of structures of the Arab Period were found in the western part of the excavated area on the south of the tell; as for the Mameluke glazed potsherds, mostly of the 13th-15th centuries according to Prof. L. A. Mayer, they were found dispersed on the surface and also in the top layer of dust throughout the excavated area.

* * *

[53] Waagé, *op.cit.* (supra, n. 52), p. 298-9, No. 293; p. 299, No. 241.
[54] Neuburger, A.: *Die Technik des Altertums.* Leipzig, 1919, p. 150 f.; Abb. 208-210.
[55] Kraeling, C. H.: *Gerasa, city of the Decapolis.* New Haven, 1938. Plan XLVI.

In the third season at Tell Qasîle, which began in June, 1950, excavation was continued in the south of the tell, west of the area excavated in the former season, and new facts have come to light which help to complete the general picture. Three of these are worthy of note:—(i). Stratum V which, in the former season, we had been unable to date, is Hellenistic, forming a connecting link between stratum VI (Persian) and stratum IV (Herodian). (ii) Building G (stratum VI, fig. 2) is merely the eastern part of a large building-complex which was excavated during the third season. (iii) At the beginning of the third season many potsherds were found of the kind called Samarian, as well as wheel-burnished potsherds and a lamp with a base: all of these belong to the ninth and eighth centuries B. C. (strata VIII-VII).

Note: The Editors of the *Israel Exploration Journal* regret that owing to the absence of the author abroad some errors have occurred in this paper.—P. 62, n. 4: for 'River of the Rocks' read 'River of the Tyrians'.—P. 68, first line after table of stratification: for square 33 read 34.—P. 68, line 6 from bottom: for VII (J) read VII (H and I).—P. 75, line 17 from top: for Q 6-8 read Q 7-9.—P. 75, bottom line: after 'paved court' insert Q 9.—

Grid and scales on plans (see author's note 8 on p. 65): The grid consists of 20-metre squares, each indicated by a number printed in its SW corner. Each of these 20-metre squares is sub-divided into sixteen 5-metre squares, each indicated by a letter and a number following the number for the 20-metre square to which it belongs, and also printed in its SW corner. See fig. 2, p. 70, where the square in the SW corner of the plan has 33d4 printed in its SW corner: 33 here indicates the 20-metre square, and d4 one of the sixteen 5-metre squares into which that square is divided. Thus the grid-squares of fig. 1 (p. 64) and fig. 9 (p. 196) measure 20 x 20 m., whereas those of figs. 2 (p. 71), 7 (p. 138), and 11 (p. 201) measure 5 x 5 m. The scale for fig. 1, p. 64, is in units of 5 metres: it should, therefore, read 5, 10, 15, 20, etc. m., and not as printed: the scales for figs. 2, 7, 9, and 11 are in metres, as printed.

This report was published in Hebrew in *Eretz Israel*, Annual of the Israel Exploration Society, 1, 1951, pp. 45-72.

A New Ammonite Inscription

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MR. G. Lankester Harding has published a group of stone statues, which were found at 'Amman casually, i.e., without archaeological evidence to fix their exact surroundings and date.[1] On the plinth of one of the statues[2] is an inscription of two lines in the classical Hebrew-Phoenician script, 'so far untranslatable' according to Harding. He writes: 'Most letters of the inscription are clear, though the dressing of the stone on which it was cut was done very roughly, and some of the heavily scored lines are apt to be confused with the letters.' 'Though the letters are clear individually, it is difficult to suggest how they should be divided up into words.'

I would like to suggest here a reading of the inscription based on the good photograph and the excellent copy of Harding (fig. 1).[3] It of course needs confirmation by examination of the inscription itself.

As Harding indicates most letters are clearly distinguishable in the photograph, and I have made only two minor changes from his copy (fig. 2):

1) In the second letter from the right of the first line the stroke downwards seems to me too long. The upper part of the letter is destroyed, but it can only be d (ד).

2) There exists no letter like the second from the left in the second line in Harding's copy. In the photo the upper stroke looks like a scratch on the stone, as just on this spot there are many scratches which are apt to be confused with the 'letters' according to Harding. There remains a distinctly recognisable p (פ).

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[1] *The Illustrated London News*, Vol. 216, No. 5783, 18.2.1950, p. 266-7. I am grateful to Mrs. Ruth Amiran, who drew my attention to this article, and has assisted me with some valuable suggestions. [2] *ibid.* figs. 3, 4. [3] *ibid.* figs. 7, 8.

Fig. 1: Lankester Harding's copy.

Only the beginning of the second line is completely destroyed: the space and the remaining stroke permit the restoration nn (נן).

Thus we get the following reading:

1. ש ד י ר ח ע ז פ
2. נ ן ר ב ר ש פ ן

Divided into words: שדירח עז—פנן רב—רשפן

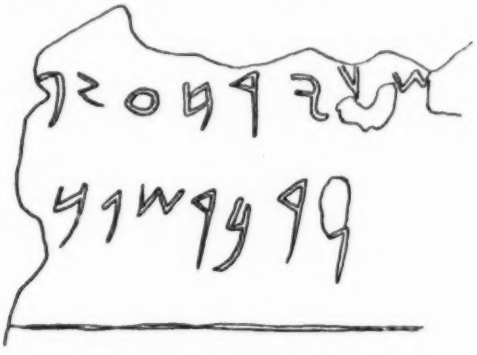

Fig. 2: The present author's copy.

The content of the inscription therefore is a name — *šdyrḥ*, followed by two attributes, each composed of two words, which are joined by construct state (סמיכות) — *'z-pnn, rb-ršpn*.

Later seals	Lachish ostraca	Samaria ostraca	Moabite Stone	Present inscription	
					ב
					ד
					ז
					ח
					י
					נ
					ע
					פ
					ר
					ש

Fig. 3: Comparative table of Hebrew alphabets referred to in the text.

The name is composed of *šdy* (שדי), the O.T. name of the God of the Fathers,[4] and *yrḥ* (ירח), the Canaanite Moon-god. The attribute *'z-pnn* appears in two O.T. passages (עז־פנים), describing power, hardness and prudence.[5] I do not know any close parallel to *rb-ršpn*, but doubtless that attribute must be connected with the Canaanite God *ršp* (רשף), the deity of fire and war, and with the Biblical passage in Job, v,7:

"כי אדם לעמל יולד ובני רשף יגביהו עוף."

[4] In the O.T. are three names composed with that theophoric element: שדיאור, עמישדי, צורישדי — Shedeur, Ammishaddai, Zurishaddai.

[5] Deut. xxviii, 50; Dan. viii, 23.

Harding indicates that 'the forms of these (letters) are strongly reminiscent of the great Stele of King Mesha of Moab...' Therefore he fixes the date of the statues in the ninth century B.C.

Indeed, of the ten different letters appearing in the inscription, six are similar to the letters of the Mesha stele: b, d, n, p, r, š (ב, ד, נ, פ, ר, ש). These letters belong however to those which underwent but few changes in the course of time. On the other hand the remaining four letters show notable differences in comparison with the Mesha inscription. Especially the forms of z (ז) and ḥ (ח) are of a later phase and resemble most closely the Samaria ostraca, the cursive script of the Lachish Letters, and later seals.[6] The y (י) also seems to be later than Mesha, while the elliptical form of the ' (ע) resembles the Samaria and Lachish ostraca.

It therefore seems to me most probable that the inscription is of a later period than that of Mesha and must be related to the seventh or eighth century B.C.

There remains the question, what do the figures represent—deities, kings or priests? The name and attributes indicate a deity. Similar pottery figurines are already known from other places in Trans-Jordan, and the resemblance between the statue discussed and the head of a pottery figurine found by Glueck in el-Medeyineh is most interesting.[7] It seems that the easily transportable figurines were made after the stone statues, and this too suggests that the latter represent deities.

[6] See e.g. the seal "ליונאל בן אלחנן", Diringer, D.: *Le iscrizioni antico-ebraiche palestinesi*, Firenze, 1934, p. 188, No. 28; Pl. 19, fig. 28; and "לשבניו עבד עזיר", *ibid.*, p. 223, No. 67; Pl. 21, fig. 4.

[7] Glueck, N.: *Explorations in Eastern Palestine. I.* Ann. Amer. Schools Orient Res., 14, 1934, pp.1-113. Ref. p. 23, fig. 6 a, b.

A Revised Earthquake-Catalogue of Palestine

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THIS paper presents a revised catalogue of earthquake occurrences in Palestine, based on various published data for the Near East. The catalogue of Bailey Willis (W),[1] compiled after the last major earthquake from recognized earthquake catalogues, has been revised and embodied in the present list with supplementary and additional data. The list of tremors has, of course, been brought up to the date of the present writing in 1951.

A basic source for many of the compilations has been the work of es-Soyuti (A1); the author is indebted to the late Mr. St. H. Stephan, then of the Department of Antiquities, Government of Palestine, for putting at his disposal a revised translation of it (A2). For the period 1860-1914 the original meteorological records of various stations in the country (Jerusalem, Hebron, Gaza, Sarona, Jaffa, Nazareth, Tiberias and others), now in the archives of the Meteorological Service of Israel, have been perused. Information about earthquake shocks from 1937 onwards, has been compiled from press reports and from the records of the Meteorological Service of Israel.

The present list does not include earthquakes occurring before 100 B. C., their dates and particulars being too uncertain.[2] Where old sources report only *Syria* as the area affected, the author has not included the earthquake in this list unless it could be established that Palestine was specifically

[1] References in brackets, as well as references at the right of the line in the catalogue, refer to the bibliographical list at the end of the paper.

[2] Earthquakes in biblical times have been included by N. Shalem in his analysis of 'The Earthquakes in Jerusalem', *Jerusalem*, 2, 1949, pp. 22-60 (Hebrew).

involved. It does not necessarily follow that because the region's main seismic area — Alexandretta, ancient Antiochia — has suffered an earthquake, the whole of the Eastern Mediterranean coast lands will likewise have been affected.[3]

It would be worth while to submit the data on earthquakes in Palestine and the Near East to a thorough seismological analysis which would provide clues to the tectonic structure and seismic affinities of the area. A question which particularly deserves closer investigation is: — which seismic areas and centres do affect Palestine and bring about seismic effects here? Sieberg (S) and Seidlitz[4] have done valuable work in this respect and their researches certainly should be continued. A contribution towards one of the many problems involved will be offered in the second part of this paper.

Seismic grades, wherever given,[5] conform to the Mercalli-Cancani scale, as revised by Sieberg,[6] which classifies earthquakes in twelve grades, the first two of which are micro-seismic, i. e., recorded by instruments only.

All times are Local Time (GMT + 2 hours).

The sign + after the year indicates that the earthquake may have occurred in that year or in the following one, as the source gives the year according to the Moslem (Hejira) era without specification of month and day.

The authors thanks are due to Messrs. E. N. Rosenan and M. Avi-Yonah, and to the late Mr. St. H. Stephan, for having supplied him with many data embodied in this catalogue, and to the Director, Meteorological Service of Israel, for his permission to make extensive use of material in the archives of the Service.

[3] The following earthquakes included in Blanckenhorn's list (B) have, therefore, been excluded from the present one:- A.D. 131, 333, 340, 349, 387, 553, 560, 992, 1127, 1212, 1666, 1854.

[4] Seidlitz, W. v.: *Diskordanz und Orogenese der Gebirge am Mittelmeer.* Berlin, 1931.

[5] Cited as SM in the text.

[6] Sieberg, A.: *Geologische und angewandte Erdbenkunae.* Jena, 1923. Ref. pp. 102-4. Cf. *Observations on Earthquakes,* Palest. Meteorol. Service, Jerusalem, 1947.

64 B.C.	Jerusalem, strong, damage to Temple and walls.	R,W
31 B.C.	Severe in Galilee.	R, E,W, S
	Moderate in Jerusalem (2, p. 64; 3). Probably many thousands killed.	Josephus *Antiq.* XV, 5, 2
24 B.C.		R,W
*	*	*
19 A.D.		R,W
30	Jerusalem, slight.	S
33	Judaea, Jerusalem, slight damage to the Temple.	R,W
37	Damages on the periphery of an earthquake at Antiochia.	S
48	Palestine, Jerusalem, moderate.	R,W
130	Palestine, Caesarea, Lydda, Emmaus ('Imwas), strong. R,W give year as 128. R,W, 4—acc. to Jerome, *Chronic.*, Patrol. latina, XVII, col. 618	
306 (*Winter*)	Destructive in Tyre and Sidon.	P, B, W, S
344	An earthquake at Antiochia, extended to the greater part of the Near East.	P, W
362	Palestine; Jerusalem—damage to the Temple area, some workmen killed—, Nablus, Beit Jibrin, Gaza.	P, R, W, S; 2, p. 64-5; 4
365	Palestine; the walls of Areopolis on the Arnon (Kerak) in Trans-Jordan collapsed.	R, W, Hieronymus, cf. 5, p.464
? 367 ?	General, Jerusalem, damage to the Temple area. Cited by a mediaeval German document only; doubtful!	6, p. 327
394		R,W
396		R,W
? 415	Hebron:- 'subito terrae motus factus est magnus', unconfirmed by other sources.	7
419	Moderate to severe. Destruction of many towns and villages.	P, L,W, S
447	Asia Minor to Egypt. Jerusalem, very strong.	R,W
498 *September* (*Elul*)	Nicopolis ('Imwas) SM 9 or more, the monastery destroyed, much loss of life.	8; 9, p. 24-5
= ? 500		R,W
502 19.8. (22. *Av*)	Acre—destructive; Tyre, Sidon—severe; Beirut—a few houses collapsed. Date according to (9):-501.	8; 9, p. 36-7

551 7. or 9.7. (*Julian cal.*) 'Magnus et terribilis terrae motus factus est per omnem Palaestinae, Arabiae, Mesopotamiae, Syriae et Phoenices regionem.' Many thousand victims. Much damage at Tyre, Sidon, Beirut, Tripoli. Tidal wave on Lebanese coast. 10, p. 192

554 *August* Cedrenus mentions Palestine, Agathias Beirut. 5, p. 802; R,W

580 B,W

583 R,W

631 or 632 Shocks continuing for a month. P,W

637 Judaea. T,W

641 Judaea. T,W

658 *June* Moderate to strong. Extensive damage. P, L,W; 3; 10, p. 288

659/660 Jericho—strong, Khan el Ahmar—Monastery of St. Euthymius destroyed. 11

672 Gaza, Ascalon, Ramle—strong. 12, p. 325, according to C. Ritter, *Erdkunde*, XVI, Berlin, 1852, pp.64,70

ab. 710 Jerusalem—damage to mosque el Aqsa. S

? 738 16.1. Very strong. Doubtful! L

746 18.1. Palestine, Jerusalem—disastrous, severe damage to the Temple area. P, B, L,W; 4; 10, p. 651; 13, p. 934
Time acc. to Cedrenus (13, p. 937) and Theophanes hora quarta, i. e., about 11 a. m. Tiberias. Kh. el Mafjer near Jericho destroyed (14, p. 65). Jerash—many of the greatest of her buildings ruined. (15). Acc. to (16) this earthquake occurred early in 748. 17

? = 748/9 18; 19, II, p. 38

756 8.3. (*Julian cal.*) Syria, Palestine; Jerusalem—strong, much damage to Temple area. P gives date as 756 or 757, 9.3. P,W; 10, p. 663; 20

765 3.5. Jerusalem—partial collapses in the mosque el Aqsa. S

Between 750 *and* 780: Jerusalem—severe damage to the Temple area (S); two shocks, the second one ruined the mosque el Aqsa. 21, p. 156-7
The last two earthquakes (765 and 750-780) are mentioned by Arvanitakis (R) as occurring between 758 and 795.

808 Jerusalem—great damage to the church of St. Mary and the mosque el Aqsa. 22

853 + Tiberias A2

856 + Persia, Syria, Arabia—very strong. A1, A2,W

859 8.4. Jerusalem—some damage to the Temple area. S

? = 860 T, R,W

881/2 Acre—tidal wave T,W

894 R,W

1002 + Jordan valley—loss of life A2

1016 Jerusalem—strong, the cupola of the Dome of the Rock collapsed. S; 2, p. 65; 13, p. 935

1032 6.3. Jerusalem, Ascalon, Gaza. Heavy damage. Tidal wave. P, B,W

1033/34 *Winter:* Lasted forty days. A1, A2, T, R,W; 2, p. 65; 13, p. 935; 23, p. 117; 24

One third of Ramle destroyed (A2,W, 13), and half of Nablus (A2, 13). Jericho destroyed (13). Much damage to buildings with loss of life at Acre, where the port fell dry for an hour by a tidal wave (13). Buildings collapsed at Hebron and Gaza (A2), apparently also at Tiberias (23). At Jerusalem damage was done to the city wall (A2,W, 2), the Temple area, and many churches. A1,W, 2, 13

The strongest shock occurred according to (13) on the evening of 4.1.1034, at Ramle according to an inscription probably on 10.12.1033. This latter date corresponds to the one given in (23), 11. Teveth = December 1033, before sunrise. The earthquake was felt from Egypt to Syria, in the cities of the Negev and in Galilee. 25

1035 Jerusalem—moderate. P, L,W

This earthquake is identical with the preceding one.

1060 Jerusalem—the roof of the mosque el Aqsa collapsed. R,W, S

1063 + Acre, Tyre. The epicentre of this earthquake was at Antiochia or in Anatolia. A2

1068 18.3. Ramle destroyed (A2, 26), two houses only remained. A2

Damage to the roof of the Dome of the Rock in Jerusalem. 26, A1, T,W

Tidal Wave (A2, 26). P gives date as 1069 (160 AH).

1070 25.2. Ramle—strong. A1, A2, L,W

? 1096 Jerusalem. Doubtful! 27

1105 24.12. Jerusalem—strong. P,W, S; 13, p. 262; 28, p. 643; 29, p. 415; 30

1113 18.7. Palestine, Jerusalem; at midnight. P, R,W; 2, p. 65

1113 9.8. Jerusalem. Hora diei tertia, i.e., approx. 9 a.m. — 28, p. 645; 29, p. 427-8

1114 10.8. Very widespread, especially in the coastal area. Many cities damaged. Jerusalem SM 3-4. Recurrent after-shocks during 5½ months. S; 28, p. 645; 31; 32, p. 69.- S, p. 195, isoseistic map

1115 *ab.* 25.12. Syria—disastrous, Hauran, Palestine, Jerusalem—moderate. P,B,W

1117 26.6. Jerusalem—strong, many buildings destroyed. 33

1119 18

? = 1120 Jerusalem. (32, p. 69) Neumann relied probably on Schwarz (18) for referenceart. This ehquake of 1119 and/or 1120 is very doubtful!

1151 Lejja, Bosra. Destructive. R,W

1156 Palestine. Strong, continuing for one month. A1, P,W

? = 1157+ Severe earthquake in Syria, 'many towns in the Latin Kingdom destroyed'. A2

1160 Jerusalem—slight. Monastery of Mar Elias seriously damaged. R,W, S

1170 29.6. Syria—disastrous. Damage and loss of life throughout Palestine. Caesarea thrown down. Tyre—damage to walls. Recurrent after-shocks for 3-4 months. P, T, R, B,W, 3, 34

? 1175 Jerusalem. Doubtful! 32, p. 69

1182 Judaea and Galilee—moderate to severe. Nablus. A1, P, L,W

1201+ Egypt to Anatolia and 'Iraq. Tyre, Acre. Nablus—30,000 killed (?!), the Samaritan quarter only escaped damage. A2

1202 20.5. Egypt, Cyprus, Syria, Hauran, Galilee, Palestinian coastal plain. A2, L, S; 3; 12, p. 325; 35; 36

Time:—'au lever de l'aurore' (36). Banias, Safed SM 9, Beit Jann SM 9, Acre SM 8—severe damage to walls, Tyre SM 7, Nablus SM 7/8—'Nablus completed the ruin' (A2), Jerusalem SM 5.

1287 R,W

1293+ Gaza, Ramle, Qaqun, Kerak—three towers of the citadel collapsed. A2

1303 8.8. A 'tremendous shock' in Egypt, felt in Acre and Damascus. (37) P,W give year as 1034.

1339 Palestine. B,V,W

1355 Palestine. R,W

1374 Palestine. R,W

1402 Several towns ruined. Tidal wave at Lebanese coast. (6,38) Doubtful.

1456+ Kerak—severe, the fortress badly damaged, 100 victims. A2

1457 Syria and Palestine. 32,000 victims. (?) R,W

?=1458 12.11. Jerusalem—cupola of a church near the Holy Sepulchre collapsed. 39

1481 Syria and Palestine. 30,000 victims. (?) R,W

1534 Palestine, Jerusalem—the tower of the Holy Sepulchre collapsed. R,W, S

Acc. to (6, p. 336) the date is wrong and this is the earthquake of 14.1.1546.

1541 Judaea—slight. S

1545 Jerusalem—tower of the Holy Sepulchre damaged. Bethlehem—church of the Nativity damaged. 13, pp. 286, 294; 23

This earthquake is probably identical with that of 1534 or 29.9.1546.

1546 14.1. *ca.* 13.00: 'Jerusalem, Hebron, Gaza, Ramle, Kerak, es-Salt, Nablus, spread as far as Damascus'. P, B, L, V, W, S, 6, 40

Jerusalem—damage to the minaret at Bab es-Silsileh and the Madrasa of Qaytbay (40, p. 87). City wall damaged near the Golden Gate. The cupola of the Dome of the Rock collapsed, as did the cupola of the Holy Sepulchre and many towers. Most houses damaged. 12 people killed. 6, p. 328

Nablus—300-500 victims; 500 people buried under the ruins 40, p. 87

Hebron, Jaffa, Damascus—severely damaged. So was Ramle (or *Rama*, as written in the German original of a MS, the French translation of which has been published by R. Roehricht in *Bibliotheca Geographica Palaestinae*, Berlin, 1890, p. 186).

Hebron—16 people killed, 70 wounded.

Gaza—The Madrasa of Qaytbay completely destroyed. 40, p. 87

The main shock was followed by a number of smaller ones.

The Jordan was stopped for two days by a landslide of Lisan marls above Jisr ed-Damiye. 6, pp. 329, 331; 41

Tidal wave at Jaffa. The sea receded 'a days walk long'. W; 6, p. 330

Acc. to (40, p. 88) this earthquake occurred on 11.7.1496.

1546 15.3. Jerusalem—stronger than the preceding one. 40, p. 88

Mayer assumes the correct date to be 10.9.1497.

1546 14.5. Mayer assumes the correct date to be 8.11.1497. 40, p. 88

1546 29.9. Samaria, peripheral effects felt in Jerusalem. S

Acc. to (6, p. 336) this earthquake is wrongly dated and identical with the one of 14.1.1546.

1577 Strong, with repetitions during 4 months. R,W

1656 Palestine. B,W

ca. 1710 Tiberias—damage to the Hot Springs. 43

Not reported by any other source; very doubtful!

1752 Coast of Syria and Palestine. Destructive. 20,000 victims. (?) R,W

1759 30.10. P, R, B, L,V,W, S; 19; S, p. 191, isoseistic map.

Time 4 a. m. (P) Affected most of Palestine and Syria. Epicentre at Safed.

Safed SM 11, 165 victims, many houses destroyed.

Tiberias—city walls overthrown. 19, III, pp. 255-7, 323

Acre—Tidal wave, flooding the streets to a height of 2—2½ ms. P, L

Sidon—much damage, houses evacuated by population, SM 7.

Many after-shocks, the strongest at Safed on:

1759 26.11.

1759 28.11. 19, III, pp. 255-7

1802 Palestine—slight. R,W

1822 13.8. Slight. Peripheral effects of a destructive earthquake at Aleppo. S, p. 195, isoseistic map

1834 23.5. 06.00: Tiberias, Acre, Jerusalem, Bethlehem, Ascalon, Gaza P, R, B, L,W, S, 44, 45

Strong, many after-shocks during 10 days. 44, p. 143

Jerusalem—several churches damaged, including the cupola of the Holy Sepulchre. Damage to the city wall, many houses and cisterns, which were thus emptied. A minaret collapsed in the city and one on the Mount of Olives; so did the cupola of the Ascension. 45, p. 92

Bethlehem—much damage to the Latin, Armenian, and Greek-orthodox monasteries (45). Acc. to (44) many people were killed.

Deir Mar Saba—a tower was cracked. 45, p. 93

Large blocks of asphalt floated on the Dead Sea. 19, II, p. 229

1837 1.1. P, M, R, B, L, V, W, S, 46, 47.- S, p. 191, isoseistic map. Epicentre near Safed.
At Beirut the first shock was felt at 16.35, it lasted 10 seconds (47). At Safed shocks were experienced almost daily until 21.1., an especially strong one on 19.1. at 15.00. 46, III, note XLI
Beirut—some damage to buildings. 46
Sidon — some houses collapsed, many damaged. A few persons killed.
Tyre—damage to the city walls and the mediaeval cathedral. Many houses collapsed. 12 persons killed, 30 injured. The inhabitants evacuated the town for a number of days.
Hunin—severe damage to the castle.
Sa'sa'—Not affected?!
el Jish—destructive, SM 11, 235 victims.
Qaddita—severe, SM 9-10.
'Ein Zeitun—destructive, SM 11.
Safed — SM 11. About 5000 victims! Clefts in the ground. The houses on the steep slopes fell on one another.
Tiberias — destructive, SM 10. About 700 victims (= 22% of the population), city walls overthrown, the output of the Hot Springs increased considerably for a number of days, the lake swept the shores and killed many people. W,47
Lubya—severe, SM 8. 143 victims (?).
Sejera—destructive, SM 9-10.
Kafr Kenna—very light damage only, SM 5.
er-Reina—destructive, SM 10-11.
Nazareth—5 killed, moderate damage to buildings, SM 7.
Saffuriya—almost unaffected, SM 4-5.
Acre—part of the fortifications overthrown, several persons killed and injured. 47
Nablus—strong, several people killed. 46
Jerusalem, Bethlehem, Hebron—moderate. 12, p. 326

1838 Judaea, Jaffa. 3000 victims, great destruction. R,W
Probably identical with the preceding one.

1844/45 Jerusalem—2 slight shocks during the year. 18

1856 12.10. Slight to moderate. S, isoseistic map

1857 21.9. *Morning:* Jerusalem — two slight shocks of about one minute's duration. 32, p. 70

1859	24.10.	*ca.* 07.15	Jerusalem—strong, probably SM 5-6.	32, p. 70
1863	22.4.	22.45	Jerusalem—'Distinctly felt'.	C
1863	24.9.	20.15	Jerusalem—probably SM 5, lasting 1/4—1/8 minute.	C
1864	24.3.	02.30	Jerusalem.	C
1865	2.7.		Jerusalem—on day of a locust invasion. Doubtful and unlikely!	48
1868	24.1.	15.50	Jerusalem—lasted about 8 seconds.	C
1868	19.2.	24.00	Jerusalem—slight.	C
1868	7.10.	19.30	Jerusalem—slight.	C
1870	24.6.		Palestine.	S
		18.00	Gaza—slight.	49
		18.30	Nazareth—slight.	49
		19.00	Jerusalem—strong.	C, L
1872			Jaffa.	B,W
1873	14.2.		Jerusalem.	S, p. 201
? =	15.2.	14.00	Nazareth—three shocks.	49
1873	29.6.	02.20	Jerusalem—severe.	C
			Jaffa.	B,W
1874	3.3.	01.40	Jerusalem—two strong shocks.	C, S
1876	21.11.	01.00	Nazareth—slight.	49
1877	15.2.	07.15	Jerusalem.	C
1877	14.3.	06.15	Jerusalem.	C
1879	31.12.	09.00	Jerusalem.	C
1885	13.3.	13.00	Jerusalem—slight.	49
1889	11.12.	02.25	Jerusalem—slight.	49
1893	12.1.	04.00	Jerusalem.	49
1896	29.6.	23.00-23.30	Jerusalem SM 4-5, Haifa, Tiberias, et-Tabgha, Safed SM 5. (B,W). (R) gives as date 28.6.	49
1898	19.3.	13.20	Haifa (Carmel), ca. 3 seconds.	49
1900	5.1.	02.00-03.00	Hebron, Jerusalem, Nazareth—slight.	B,W, S, 49
		02.45	Tiberias—slight shock from E to W, lasting 3 seconds.	49
		03.00	Haifa—5 seconds, direction W to E.	B
			—Carmel, 4 seconds, direction S to N.	49

1903	29./30.3.		B,W, S, 49; S, p. 191—isoseistic map. Jerusalem:—Fore-shock 23.00-23.30, SM 3-4. Main shock 01.05, SM 5-6. Three strong shocks, followed by an earthquake lasting 3-5 seconds. Mount of Olives SM 7. Aftershock 05.00, SM 2-3.	
		Midnight:	Hebron SM 4.	
		00.45	Gaza—three shocks within 6 seconds.	
		00.30-01.00	Jaffa SM 7. Three horizontal shocks from NW to SE. Duration one minute.	
		00.30	Sarona.	
			Latrun SM 7, Bethlehem SM 7, Jericho SM 7, Nablus SM 8, Jenin SM 7.	
			Tell Ti'innik 01.00, SM 6, 6 seconds.	
			01.30, SM 6, 3-4 seconds.	
			Haifa, Mt. Carmel 01.15, SM 5.	
			Nazareth SM 6-7, Beirut.	
1903	19.12.	02.20	Jerusalem.	49
	=	02.44	Jerusalem—slight.	B
		02.30	Hebron—15 seconds.	49
1907	1.2.	*a. m.*	Hebron—slight.	49
1914	24.6.	18.40	et-Tabgha—slight.	50
1918	29.9.	14.15	Haifa SM 3, ? Qalqiliya.	51
1921	18.4.	02.45	Bethlehem (Galilee)—slight tremor.	52
1921	21.4.	10-11	Bethlehem (Galilee)—shock, SM 4.	52
1921	22.4.	12.00	Bethlehem (Galilee)—slight.	52
1921	22.4.	13.25	Bethlehem (Galilee).	52
1921	22.4.	17.46	Bethlehem (Galilee)—tremors.	52
1921	25.4.	10.21	Bethlehem (Galilee)—shock, SM 3.	52
1921	27.4.	04.45	Bethlehem (Galilee)—slight tremor.	52
1921	29.4.	13.10	Bethlehem (Galilee)—slight tremor.	52
1921	1.5.	17.15	Bethlehem (Galilee)—slight tremor.	52
1921	2.5.	02.00	Bethlehem (Galilee)—slight tremor.	52
1921	6.5.	13.10	Bethlehem (Galilee)—slight tremor.	52
1921	19.5.	17.15	Bethlehem (Galilee)—slight tremor.	52
1921	25.5.	18.37	Bethlehem (Galilee)—slight tremor.	52

Most of these shocks were observed at Safed as well, partly with SM 5-6.

1921	8.6.	15.00	Bethlehem (Galilee)—slight tremor.	52	Most of these shocks were observed at Safed as well, partly with SM 5-6.
1921	25.6.	14.00	Bethlehem (Galilee)—slight tremor.	52	
1922	5.5.	20.00	Nazareth—slight tremor.	53	
1922	8.5.	23.00	Nazareth—slight tremor.	53	
1922	9.5.	01.00	Nazareth—slight tremor.	53	
1922	9.5.	03.30	Nazareth—slight tremor.	53	
1922	21.5.	14.00	Nazareth—slight tremor.	53	
			Bethlehem (Galilee).	52	
1922	22.5.		Nazareth.	52	
1922	23.5.		Waldheim.	52	
1923	27.2.	20.15	Waldheim—probably SM 4.		52
1924	27.2.		Dera'a SM 6, Jerusalem and Jaffa SM 4.		S, p. 191, isoseistic map.
1926	26.6.		Jerusalem SM 5.		S, p. 165, isoseistic map
1927	11.7.	15.05			W; S, p. 174, isoseistic map; 7; 54.

Time recorded at Jericho 15.08; duration 15 secs. 49
No fore-shock felt, i.e., the epicentre was in the immediate neighbourhood.
Area : - Judaea from Hebron to Nablus, Ramle — Lydda, Jordan Valley, er-Reina near Nazareth, Trans-Jordan.
SM10:- Nablus, er-Reina.
SM 9:- I'billin—er-Reina, Sebastiya—Lubban, er Ram, Abu Dis, Lydda, es Salt (local), Umm Rawa (Yarmuk Valley).
SM 7-8:- Southern coastal plain, Negev, coastal plain from Herzliya to Haifa, Lebanon, Eastern Trans-Jordan.
Total casualties : - about 500 persons killed; 350 severely injured in Palestine, and 360 in Trans-Jordan.

Damage to buildings and casualties:— 54

	Houses collapsed or seriously damaged	Number of persons killed	Number of persons injured
Acre	3		
Kafr Manda		1	4
er-Reina	5 killed, 9 injured. 160 out of 200 houses damaged. Government had the village evacuated and a completely new village built, 700 ms. SE of the old site.		
Mash-had		1	
Tiberias	8 (or 28) collapsed, 150 damaged.		
'Ubeidiya		3	
Beisan	2		
Nablus	69 persons killed, more than 100 injured. About 300 houses collapsed in the southern part of the city on the lower slopes of Mount Gerizim, and on the alluvial ground between Mount Gerizim and Mount Ebal, i. e., nearly half the houses of this quarter.		
Beit Dejen (Samaria)		2	2
Mazari' en Nubani	7	4	
'Atara	20		
Bir Zeit	15		5
Yabrud	40	1	1
'Ein Yabrud	12	2	4
Ramallah	17	1	1
'Ein Qinya	20	1	1
'Ein 'Arik	15	1	1
Deir Ibzi'	2		
Beit 'Ur al-Fauqa	20		
Beit 'Ur et-Tahta	20		
Kharbata	1		
Saffa	15	3	
Beit Sira	3		
Beit Liqya	50	1	4
Bir Imma'in		2	6
Jimzu		1	12
Beit Nuba		2	2
Yalu		4	2
el-Qubab		1	1
Rammun	10	4	
Mukhmas	15	9	6
Jaba'		1	4
Kafr 'Aqab	6		
Qalandiya	2		
er-Ram	Nearly ruined		
Qatanna		1	
Beit Surik	1		2
Lifta	12	1	3
'Ein Karim	2	5	
Jerusalem	3 killed, 12 injured. 17 houses damaged, most of them buildings of inferior construction in the Old City. 5 houses collapsed in the suburb of Beit ha-Kerem.		
et-Tur (Mount of Olives)	12	3	2
Silwan		4	2
Abu Dis	90	4	3
Sur Bahir	1		
Jericho	5	3	
Allenby Bridge	4		
Hebron	15	7	
Dura	2		
Ramle	30	16	50
Lydda	45	17	70

Rockfalls or landslides on Jerusalem—Jericho Road at kms. 7.9, 8.1, 27.3, 29.4. Allenby Bridge damaged. Clefts in ground in Jordan Valley.

Casualties in Trans-Jordan:—

	Killed	Injured
Irbid	15	20
'Ajlun	6	2
es-Salt	35	34
'Amman	9	35
Madaba	2	5

Flow of river Jordan stopped for 21½ hours owing to landslide at Jisr ed-Damiye. 42

1927	11.7.	15.50	From Trans-Jordan this time was reported for the shock.	55
1927	12.7.	05.30	Jerusalem—slight.	49
? 1927	12.7.	15.05	Apparently not real.	54
1927	13.7.	11.30	Trans-Jordan—slight. Not reported from Palestine.	55
1927	17.7.	10.15	Throughout Palestine, SM 4-5 (49). Jerusalem, SM 4.	S, 54
			Some houses collapsed in Trans-Jordan.	55
1927	24.7.	11.45	Jerusalem, Hebron—slight.	S, 54, 56
		12.00	Time reported from Trans-Jordan.	55
1927	30.7.	13.46	Jericho. Duration 3 secs. (source states 3 min.).	49
1927	2.8.	08.24	Jericho. Duration 2 secs.	49
		10.00	Trans-Jordan. Not reported from Palestine.	55
1927	14.8.	22.30	Jerusalem—slight.	54, 56
1927	15.8.	22.30	Jericho. Duration 3 secs.	49
			This should be identical with the preceding one.	
1928	18.1.		Jerusalem at 08.10 hours, SM 3. (W) Time acc. to (57):—	
			07.50. Moderate, no damage.	S
			Jericho 08.00.	49
1928	25.1.	23.20	Jericho.	49
1928	26.1.	06.15	Jericho.	49
1928	28.1.	19.53	Trans-Jordan. The severest of the after-shocks of the earthquake of 11.7.1927 felt in Trans-Jordan. Not reported from Palestine. This shock is apparently wrongly dated and identical with the one of 22.2.1928.	55

1928	22./23.2.		Palestine. The strongest after-shock of the earthquake of 11.7.1927 in Palestine. Fore-shock 03.00. Main shock 22.00. 56 Jerusalem:—Fore-shock 02.47. Main earthquake 19.53, SM 5. After-shock 02.00, very slight. 54 Jericho:—Fore-shock 02.45; main earthquake 19.50. 49
1928	4.4.		Jerusalem—slight S
1928	5.8.	05.45	Jerusalem—slight S, 56
1930	21.5.		Jerusalem—slight S
1930	12.9.		Jerusalem—slight S
1937	12.10.	11.56	Jerusalem SM 3, Nablus.
1940	27.1.	07.00	Haifa SM 5.
1940	25./.	00.20	Beirut, Safed SM 5, Nazareth, Nablus, Haifa, Tel Aviv SM 4, Lydda SM 4.
1940	2.9.	12.32	Beersheba, Gaza, Tel Aviv SM 4-5, Lydda Airport SM 3, Petah Tiqvah SM 4, Latrun SM 4-5, Rafat SM 5-6, Jerusalem SM 3-4, Mount of Olives SM 4-5, Dead Sea South SM 5-6, 'Amman SM 5-6, Haifa.
1941	20.1.	01.00	Tel Aviv, Jericho; fore-shock.
		05.40	Throughout Palestine, SM 4, at Tel Aviv probably SM 5. Safed, Tiberias, Nazareth, Naharia, Acre, Haifa, Kfar Saba, Tel Aviv, Lydda Airport, Jerusalem, Jericho, Beersheba.
1941	10.5.	*ca.* 23.30	Jaffa SM 2-3. Doubtful!
1941	12./13.11.	*night:*	Mount of Olives only, SM 2-3.
1942	11.2.	04.35	Gaza only—slight, no damage.
1942	21.6.	06.40	At different places in Palestine. Slight.
1942	6.8.	14.30	Nablus only. Slight tremor.
1942	12.8.	18.30	Tel Aviv—four slight tremors.
1942	26.12.	11.17	Tel Aviv SM 3-4. Duration 4-5 seconds. Somewhat doubtful.
1943	10.9.	09.51	Throughout Palestine, Jerusalem SM 5 (the severest earthquake since 1928). One wave-like movement. Duration 1 sec. Faint thunderlike noises. Tel Aviv SM 4-5: 3 shocks, the last being the severest one. Nablus, Jenin SM 5, Haifa, Nazareth SM 5 (3 secs.), Safed SM 6, Yavne'el SM 6-7: three shocks, the first one strong, the others slight ones.

			Tiberias
			Ma'oz and Jordan Valley SM 7 (2-4 seconds).
			Emanation of white material from springs or from the shore into the Dead Sea, causing prolonged discoloration. 58
1943	29.9.	?13.30	Nablus—slight, 2 seconds.
1943	16.10	?16.00	Jerusalem. 3-4 seconds. 'Distinct, but slight'. Somewhat doubtful!
1944	4.7.	21.30	Dead Sea South, Camp. SM 4. Two vertical shocks.
1944	*September*		Galilee—slight.
1944	7.10	12.30	Galilee and Upper Jordan Valley.
			Safed SM 6. 3 seconds. Accompanied by noises.
			Metulla, Rosh Pinna, Tiberias SM 5.
			Jerusalem—slight.
			Reported from other parts of Palestine as well.
1945	19.3.	21.20	Nazareth SM 5, lasted a few seconds. Villages near Nazareth.
1945	2.9.	13.56	Jerusalem SM 3, Mount of Olives SM 3-4, two distinct shocks, direction N to S.
			Tel Aviv—two slight shocks.
			Nablus—6 seconds.
			Cairo SM 5, 4 seconds.
1946	25.12.		Haifa—slight. Doubtful!
1947	15.9.	02.40-02.43	Carmel and Galilee. 20 secs. Direction S to N.
			Haifa-Mt. Carmel SM 5. Naharia SM 5. Safed SM 5.
			Degania 'A' between 02.30 and 03.00, SM 3, duration few secs., direction SSE to NNW.
1947	10.12.	01.00	Jenin SM 5. Two shocks of 3 secs. duration; beds swayed.
		01.44	Geva' SM 4-5. 3 shocks, first one strongest. Direction S to N.
		01.45	Safed, strong, several secs.
		01.45	Degania 'A' SM 5. Two waves from N to S, of 'considerable duration'. Many people awoke.
			Haifa SM 4. (Mt. Carmel, Hadar, Haifa Bay, Kfar Atta). The time given for Haifa—ab. 04.30—disagrees with that of all other reports.
			Peripheral effects of a strong earthquake in Anatolia, which was felt in the Levant countries and Cyprus.

1948 24.7. 12.05 Tel Aviv SM 4-5.
Peripheral effects of a strong earthquake in Lower Egypt, felt at various places in Palestine.

1949 1.1. 18.55 Beit Alfa—Heftzibah, Beit ha-Shitta SM 4-5. Two shocks from W to E. Duration 1 sec.

1949 3.1. 21.05 Tel Aviv SM 5, Nathanya SM 4-5.

1949 17.3. *early morning:* Tiberias and surrounding area, slight, duration 2 secs.

1949 14.4. 14.10-14.15: Yavne'el SM 3.
ca. 14.30 Tiberias SM 4, Beit Zera', Sha'ar ha-Golan.

1949 15.4. *ca.* 00.15: Tiberias SM 4, Sha'ar ha-Golan, Yavne'el SM 4.

1949 15.4. *ca.* 00.40: Tiberias SM 3, Sha'ar ha-Golan.

1949 28.10. 20.15 Haifa—Mt. Carmel. Tremor from West to East, SM 3.
21.10 Safed SM 5-6, Naharia, Tel Aviv SM 2-3.

1950 1.3. 23.30 Safed SM 4-5, duration 3-4 secs.

1951 31.1. 01.10 unless stated otherwise.
Throughout the country, SM 5.
Huleh Plain—Qiryat Shmona, Ayelet ha-Shahar.
Upper Galilee—Safed: people left their houses.
Yiron: duration ab. 10 secs., time stated as 01.05.
Tiberias, Afikim: direction N-S.
Nazareth, Davrat: SM 4, Gineigar: direction N-S.
Yagur, Haifa: two shocks, the first and stronger one at 01.12, duration ab. 2 secs.
Coastal Plain:—'Ein ha-Horesh, Herzliya: direction given as E-W, Petah-Tiqvah. Ramat Gan 01.07, very soft movements, direction N-S (or NW-SE); duration ca. 2 secs. Tel Aviv 01.07, duration 2-3 secs., Lydda, Rishon le-Zion.
Jerusalem 01.08, Motza-Arza 01.08, strong shock of ca. 5 secs. duration, followed by two lighter ones.
Negba, Sa'ad SM 3-4.
Beersheba and surrounding Negev area.
Cairo

APPENDIX 'A':

THE FOLLOWING TSUNAMIS OR SEISMIC SEA WAVES ON THE COAST OF PALESTINE ARE ON RECORD.

551	9.7.	Lebanese coast.-'Recessit etiam mare in altum pelagi sinum ad mille passus: ex quo multae naves in profundum submersae'.	10, p. 193
881/2		Tidal wave at Acre.	T,W
1032		Tidal wave at Gaza and Ascalon.	P, B,W
1034	4.1.	At Acre the port fell dry for an hour.	13, p. 935, according to Yahia of Antiochia
1068	18.3.	The sea receded for the distance 'of a day's walk'.	A2, 26
1402		Lebanese coast. The sea receded and then invaded the land.	3, 38
1546	14.1.	At Jaffa the sea receded for the distance 'of a day's walk'.	W; 6, p. 330
1759	30.10.	'At Acre the sea rose'.	L
		Cf. Smith *Jerusalem*, I, p. 72 and note 6 *ibid.*	2

TOPOGRAPHICAL INDEX

The earthquake of 11.7.1927 has not been included in this index as it affected the whole of Palestine.

Acre 502, 881-2, 1033-34, 1063+, 1201+, 1202, 1303, 30.10.1759, 1834, 1837, 20.1.1941.
Afikim 31.1.1951.
'Amman 2.9.1940.
Ascalon 672, 1032, 1834.
Avelet ha-Shahar 31.1.1951.

Banias 1202.
Beersheba 2.9.1940, 20.1.1941, 31.1.1951.
Beit Alfa—Heftzibah 1.1.1949.
Beit Jann 1202.
Beit Jibrin 362.
Beit ha-Shitta 1.1.1949.
Beit Zera' 14.4.1949.
Bethlehem 1545, 1834, 1837, 29.-30.3.1903.
Bethlehem (Galilee) April-June 1921, 21.5.1922.
Bosra 1151.

Caesarea 130, 1170.

Davrat 31.1.1951.
Dead Sea South (Sdom) 2.9.1940, 4.7.1944.
Degania 'A' 15.9.1947, 10.12.1947.
Dera'a 27.2.1924.

'Ein ha-Horesh 31.1.1951.
'Ein Zeitun 1837.
Emmaus—see 'Imwas.

Gaza 362, 672, 1032, 1033-34, 1293+, 14.1.1546, 1834, 24.6.1870, 29.-30.3.1903, 2.9.1940, 11.2.1942.
Geva' 10.12.1947.
Gineigar 31.1.1951.

Haifa 29.6.1896, 19.3.1898, 5.1.1900, 29.-30.3.1903, 29.9.1918, 27.1.1940, 25.7.1940, 2.9.1940, 20.1.1941, 10.9.1943, 25.12.1946, 15.9.1947, 10.12.1947, 28.10.1949, 31.1.1951.
Hebron ?415, 1033-34, 14.1.1546, 1837, 5.1.1900, 29.-30.3.1903, 19.12.1903, 1.2.1907, 24.7.1927.
Herzliya 31.1.1951.
Hunin 1837.

'Imwas 130, 498.

Jaffa 14.1.1546, 1838, 1872, 29.6.1873, 29.-30.3.1903, 27.2.1924, ?10.5.1941.
Jenin 29.-30.3.1903, 10.9.1943, 10.12.1947.
Jerash 746,
Jericho 659-660, 746, 1033-34, 29.-30.3.1903, 30.7.1927, 2.8.1927, 15.8.1927, 18.1.1928, 25.1.1928, 26.1.1928, 22.2.1928, 20.1.1941.
Jerusalem (including Mount of Olives) 64 B.C., 31 B.C., 30 A.D., 33, 48, 362, ?367, 447, ca. 710, 746, 756, 765, 808, 859, 1016, 1032, 1033-34, ?1035, 1060, 1068, ?1096, 1105, 18.7.1113, 9.8.1113, 1114, 1115, 1117, 1120, 1160, ?1175, 1202, 1458, 1534, 1545, 14.1.1546, 15.3.1546, 29.9.1546, 1834, 1837, 1844-45, 1857, 1859, 22.4.1863, 24.9.1863, 24.3.1864, ?2.7.1865, 24.1.1868, 19.2.1868, 7.10,1868, 24.6.1870, 14.2.1873, 29.6.1873, 3.3.1874, 15.2.1877, 14.3.1877, 31.12.1879, 13.3.1885, 11.12.1889, 12.1.1893, 29.6.1896, 5.1.1900, 29.-30.3.1903, 19.12.1903, 27.2.1924, 26.6.1926, 12.7.1927, 17.7.1927, 24.7.1927, 14.8.1927, 18.1.1928, 22.2.1928, 4.4.1928, 5.8.1928, 21.5.1930, 12.9.1930, 12.10.1937, 2.9.1940, 20.1.1941, 12.-13.11.1941, 10.9.1943, 16.10.1943, 7.10.1944, 2.9.1945, 31.1.1951.
el-Jish 1837.

Kafr Kenna 1837, 19.3.1945.
Kerak 365, 1293+, 1456+, 14.1.1546.
Kfar Saba 20.1.1941.
Khan el-Ahmar 659-660.

Latrun 29.-30.3.1903, 2.9.1940.
Lubya 1837.
Lydda 130, 25.7.1940, 2.9.1940, 20.1.1941, 31.1.1951.

Mar Elias Monastery 1160.
Mar Saba Monastery 1834.
Mafjer, Kh. el 746.
Ma'oz 10.9.1943.
Metulla 7.10.1944.
Motza 31.1.1951.

Nablus 362, 1033-34, 1182, 1201+, 1202, 14.1.1546, 29.9.1546, 1837, 29.-30.3.1903, 12,10.1937, 25.7.1940, 6.8.1942, 10.9.1943, 29.9.1943, 2.9.1945.
Naharia 20.1.1941, 15.9.1947, 28.10.1949.
Nathanya 3.1.1949.

Nazareth 1837, 24.6.1870, 15.2.1873. 21.11.1876, 5.1.1900, 29.-30.3.1903, May 1922, 25.7.1940, 20.1.1941, 10.9.1943, 19.3.1945, 31.1.1951.

Negba 31.1.1951.

Petah Tiqva 2.9.1940, 31.1.1951.

Qaddita 1837.

Qalqiliya ?29.9.1918.

Qaqun 1293+.

Qiryat Shmona 31.1.1951.

Rafat 2.9.1940.

Ramat Gan 31.1.1951.

Ramle 672, 1033-34, 1068, 1070, 1293+, 14.1.1546.

er-Reina 1837, 19.3.1945.

Rishon le-Zion 31.1.1951.

Rosh Pinna 7.10.1944.

Sa'ad 31.1.1951.

Safed 1202, 30.10.1759, 26.11.1759, 28.11.1759, 1837, 29.6.1896, April-June 1921, May 1922, 25.7.1940, 20.1.1941, 10.9.1943, 7.10.1944, 15.9.1947, 10.12.1947, 28.10.1949, 1.3.1950, 31.1.1951.

Saffuria 1837.

Saida—See Sidon.

Sejera 1837.

es-Salt 14.1.1546.

Sha'ar ha-Golan 14.4.1949, 15.4.1949.

Sidon 306, 502, 551, 30.10.1759, 1837.

et-Tabgha 29.6.1896, 24.6.1914.

Tel Aviv 25.7.1940, 2.9.1940, 20.1.1941, 12.8.1942, 26.12.1942, 10.9.1943, 2.9.1945, 24.7.1948, 3.1.1949. 28.10.1949, 31.1.1951.

Tell Ti'innik 29.-30.3. 1903.

Tiberias 746, 853+, 1033-34, ca. 1710, 30.10.1759, 1834, 1837, 29.6.1896, 5.1.1900, 20.1.1941, 10.9.1943, 7.10.1944, 17.3.1949, 14.4.1949, 15.4.1949, 31.1.1951.

Tyre 306, 502, 551, 1063+, 1170, 1201+, 1202, 1837.

Waldheim 23.5.1922, 27.2.1923.

Yagur 31.1.1951.

Yavne'el 10.9.1943, 14.4.1949, 15.4.1949.

Yiron 31.1.1951.

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(To be concluded)

NOTES AND NEWS

IN 1948 the RESEARCH COUNCIL OF ISRAEL was formed in order to coordinate research undertaken by various organisations and institutions in Israel, and to initiate or undertake, on behalf of the government, research not falling within the sphere of any specific ministry. It is affiliated to the Prime Minister's Office, and Professor S. Sambursky has been appointed its chairman. It is publishing the quarterly *Bulletin of the Research Council of Israel* (Vol. 1—1951), which is devoted to papers of regional interest in geology, meteorology and biology, besides other sciences as applied to local industries, such as citrus processing, plastics, etc.

* * *

The Israel DEPARTMENT OF SURVEYS continues the work begun during the mandatory period by the Survey of Palestine. The Department is attached to the Ministry of Labour and Social Welfare, and Mr. J. Elster is the Director. The development programme of the state of Israel brought about a considerable enlargement in the scope of the Survey. To deal with all its tasks the department is organised in the following sections:—administration, planning, field survey, computation, cartography, photogrammetry, drawing, cadastral survey, printing, map archives, and the control of maps and plans drawn by licensed surveyors; there are also district survey offices, a school of surveying, instrument stores and a repair workshop.

Amongst the activities of the department special mention may be made of the extension of the triangulation network of the country to include the Negev, and the endeavour to bring up-to-date and expand the different series' of topographical maps: the 1:250,000, of which a completely revised edition has been issued in 1951 (cf. *Israel Explor. Journ.*, 1, 1950-51, p. 184), the 1:100,000-series and the 1:20,000-series. Sheets recently issued show considerable improvement in cartographic appearance.

* * *

The CENTRAL BUREAU OF STATISTICS of Israel has been reorganised under Prof. R. Bachi as director, and is affiliated to the Prime Minister's Office. The Bureau is divided into three main divisions:— social and demographic statistics including immigration, economic statistics, and the technical and administrative division. The Bureau is equipped with modern statistical machinery, and issues the following periodical publications: — *Statistical Bulletin of Israel* (Hebrew and English), *Statistical Notes* (Hebrew, mimeographed, a weekly review containing up-to-date current statistics) and the *Statistical Abstract of Israel* (Hebrew and English),

an annual of which the first volume, for 1949/1950, has been published. Most of the material in the Abstract had already been published in the *Government Yearbook for 1950-51.*

* * *

The ISRAEL DEPARTMENT OF ANTIQUITIES has continued its excavations and researches in various parts of the country, either through its officials alone, or in conjunction with local *Friends of Antiquities* (its semi-official local representatives), and sometimes in co-operation with other institutions.

Surface exploration has led to the discovery of two more prehistoric stations: in the *Yiron* plain (Upper Galilee) were found hand-axes covered with ochre patina, and, bulbar cores of Pre-Acheulean and Acheuleo-Micoque date. — In the Wadi Hudheira near Neve Ya'ar (formerly Waldheim, south-west of Nazareth) Chellean flints were picked up.

Dr. M. Stekelis continued his researches in the Yarmukian culture at *Sha'ar ha-Golan.* His most important find was that of a refuse dump of a Neolithic flint workshop, some 25 metres square, which promises to yield valuable information on the technique of the period. In another part of the site a fireplace was discovered, the finds including a limestone bowl, flint axes, saws, and blades, a Neolithic figurine and a human lower jaw-bone. A few Palaeolithic flints were also found.

MM. R. Neuville and J. Perrot excavated, on behalf of the CENTRE NATIONALE DE LA RECHERCHE SCIENTIFIQUE, a prehistoric site at *Abu Ghosh,* west of Jerusalem. The finds included Tahunian, Yarmukian, Jerichoan and Ghassulian arrow-heads, sickle-blades (polished by use), axes of various sizes, pumex and obsidian objects, bones and kitchen refuse, and two pottery figurines representing cattle. The nearest affinities to the culture of this site are found in Jericho X-XVII and at el-Khiyam: in general, however, it affords interesting glimpses into the northern (in particular Syrian) influences at the transition from the Mesolithic to the Neolithic.

The extension of road-making and building activities at *Tel Aviv* has led to the discovery that this city, often considered the youngest and most modern of the urban settlements in Israel, has an historical past of very respectable length. Mr. J. Kaplan, acting on behalf of the ISRAEL DEPARTMENT OF ANTIQUITIES and the TEL AVIV MUNICIPALITY has discovered in northern Tel Aviv the remains of no less than six periods. The oldest is the Ghassulian: pit dwellings, a basalt bowl with geometric ornament, flint axes and hammers, tombs with fragments of painted ossuaries. The Early Bronze Age is re-

presented by cremated burials, pebble pavements, pottery fishers' weights. Remains of the Middle Bronze Age II, i. e., Hyksos, include ten tombs near the port of Tel Aviv, mostly rectangular pits, with funerary equipment of pottery, jewellery, tools and weapons of rare completeness; also a pottery kiln with a brick superstructure, and stone and pottery loom weights, pottery figurines, etc. Iron Age II is represented by Israelite pottery and Persian remains (foundations, Astarte figurines, a stamped jar-handle). A line of small forts parallel with the Yarkon river are Hellenistic (Maccabean?).

Excavations at *'Affule*, undertaken by the DEPARTMENT OF ANTIQUITIES, and directed by Dr. I. Ben-Dor and later by Mr. M. Dothan, led to the discovery of two very important installations: a potter's refuse pit of Middle Bronze Age II, full of unfired sherds of Yahudiye ware, thus establishing conclusively the local manufacture of this ware, and a Late Bronze / Early Iron Age foundry for bronze. The latter had the form of a vault, 7 m. long, with a stone foundation and a brick upper part; ashes and clinkers of copper slag proved the purpose of this installation. Other finds on this site included a Middle Bronze Age necropolis of shallow graves, filled with funerary pottery equipment: large jars covered with deep bowls.

A quite unexpected discovery between Jaffa and *Bat Yam*, to the south, were the remains of a small port and settlement of the Persian Period. The site yielded a remarkable selection of fifth century Attic pottery, including some complete vases.

A Hellenistic-Roman necropolis of plain graves and built tombs, with clay and wooden coffins, the latter identified by their iron nails, was discovered at the foot of Tell el Fukhkhar, east of *Acre*. The finds include glass and pottery, including terra sigillata, of the Herodian Period and later. The excavation was undertaken by Mrs. R. Amiran on behalf of the DEPARTMENT OF ANTIQUITIES.

A Roman theatre (with diazoma, vomitorium at least 4 m. deep, scena, partly paved with greyish marble, and orchestra paved with limestone) was found at *Dor*. The theatre had a diameter of 60 m. and faces northwards towards the sea. It has been partly excavated by Dr. J. Leibovitch of the DEPARTMENT OF ANTIQUITIES.

At *Binyamina* a casual discovery led to the excavation of the foundation of another part of a Caesarea aqueduct, some 300 ms. long. It is uncertain whether this had ever been completed. Drs. Ben-Dor and Hamburger were in charge of the excavation.

At *Beth Yerah* Mr. P. L. O. Guy, with Mr. P. Bar-Adon, excavating on behalf of the DEPARTMENT OF ANTIQUITIES, discovered within a fortified temenos the remains of an apsidal building (37 by 22 m.) of Early Byzantine date. A large area of this building had been paved with mosaics, some fragments of which were decorated with plant and animal ornament including a stylized ethrog tree; there was also the incomplete representation of a man and a horse. The position of the apse, pointing to south, and the find of a column-base decorated with a seven-branched candlestick and other ritual objects lead to the supposition that the building was a synagogue, although it is larger than those so far found in Israel.

At *Beth Alpha* the DEPARTMENT OF ANTIQUITIES repaired the mosaic floor of the synagogue, found in 1928. These repairs led to the discovery that there was an earlier floor under it; the few fragments found show geometrical designs.

Prof. E. L. Sukenik and Mr. N. Avigad, acting on behalf of the HEBREW UNIVERSITY, cleared the remains of the synagogue at *Iaphia*, s.w. of Nazareth. The remains include the southern stylobate of the synagogue; the width of the building was 15.70 m. Owing possibly to its supposed position in the tribal area of Zebulon, who 'shall dwell at the heaven of the sea', i.e., in the west, the synagogue was oriented east. The fragments of mosaic pavement include a large circle with twelve smaller circles surrounding it; these contained the symbols of the Twelve Tribes (the first found so far in a synagogue pavement). The symbols of Manasseh and Ephraim can be distinguished, the latter with a fragmentary inscription (EPH)RAIM.

The planting of a park on the site of the *Safed* Citadel was preceded by a small clearance undertaken by Mr. M. Dothan on behalf of the DEPARTMENT OF ANTIQUITIES: the finds were mainly remains of the Crusader fortress. Three metres of wall, built partly of stones with the characteristic diagonal dressing, were uncovered.

* * *

In July, 1949, the Government of Israel appointed a GEOGRAPHICAL NAMES COMMISION, composed of geographers, archaeologists and historians, under the chairmanship of the late Mr. Z. Lif. The Commission was entrusted with the task of giving Hebrew names to the various geographical features in the country. It began work on sheet 3 of the 1: 250,000-map, which covers the southern part of Israel, and completed this sheet within a year. The Hebrew edition of the new map has been issued by the SURVEY OF ISRAEL, and an English edition will follow as soon as the Government Transliteration Committee has completed its task. The Names

Commission has based its work on the assumption that most of the present Arabic names in Israel are translations or assimilations of originally Hebrew names. It has been guided by the following principles: it has restored as far as possible all historic names known from ancient sources; it has sought to recover the Hebrew roots of many Arabic words; it has tried to restore the ancient Hebrew names by finding new names resembling the Arabic names in sound, or by translating their sense (thus reversing the process which we can observe in the equation Tell el Qadi= Dan); and it has finally commemorated outstanding historical personages connected with the Negev, and with events of the War of Independence: it has also adopted some popular appelations created by the army or by travellers in the Negev. The completed Gazetteer, published in the *Government Yearbook for 1950-51*, includes 561 names.

In March, 1951, the commission was reorganized, and amalgamated with the commission which, on behalf of the Jewish National Fund, had been deciding on names for new settlements during the last thirty years. At present the joint Commission, under the chairmanship of Dr. A. Biran, is working on sheet 2 of the 1:250,000-map, which goes as far north as the river Yarkon.

* * *

The ISRAEL NUMISMATIC SOCIETY held its first convention at the Municipal Archaeological Museum, Haifa, on 30-31 March, 1951, at which were discussed problems of ancient Jewish coinage. The opening address was delivered by Mr. L. Kadman; papers were read by Prof. A. Reifenberg on *The importance of numismatic studies for research in Jewish history*, B. Kanael on *The dating of Hasmonaean coins*, A. Kindler on *The sons of Herod I and their coins*, Dr. Mestchansky on *Agrippa I and his coins*, L. Kadman on *The epigraphy of Jewish coins*, and Dr. L. Mildenberg, Zürich, on *The coinage of the Bar Kokhba War*.—The convention concluded with a discussion of the papers read, and the election of the Committee of the Society, with Prof. A. Reifenberg as President and Mr. L. Kadman as Chairman

* * *

Obituary: The Editors regret to have to record the death of Mr. DAVID REMEZ, Israel Minister of Education and Culture, in his sixty-fifth year. Besides his many political, economic and educational activities, Mr. Remez took a deep interest in archaeological and philological research. During his detention at Latrun by the Mandatory Government in 1946 he wrote a series of studies on the prehistory and Early Bronze Age of Palestine, which were marked by sound knowledge and many terminological innovations. As Minister of Education, since October, 1950, he was responsible for the activities of the Israel Department of Antiquities.

Mr. Remez was instrumental in the organization and financing of many expeditions both before and after the proclamation of the State of Israel.

* * *

Personal News: Prof. B. Z. Dinaburg has been elected Dean of the Faculty of Humanities of the Hebrew University for 1951-53.—Dr. B. Maisler has been elected head of the Institute of Jewish Studies for 1951-52.

The Editors of the *Israel Exploration Journal* congratulate Professor William Foxwell Albright on the occasion of his sixtieth birthday.

STELLA BEN-DOR—*IN MEMORIAM*

A TRAGIC fate has taken Stella Ben-Dor from our midst. Always friendly, always helpful, her whole life was devoted to work and duty. Her main interest was concentrated on the non-Jewish coins of Israel and the surrounding countries. She was fascinated by the interesting reverses which give us so important a picture of ancient beliefs, mythology and architecture. Her numismatic contributions to the *Palestine Exploration Quarterly*, to *Berytus*, etc., show the exactness of her observations and were always of historic interest. In this connection her papers on Petra Colonia, on the era of Nysa-Scythopolis and on the Seleucid coinage may especially be mentioned.

It was mainly thanks to her efforts that the important coin collection of the Museum of Jewish Antiquities at the Hebrew University was formed and catalogued, and she was deeply distressed when Mount Scopus and the collection became inaccessible owing to the Israel-Arab war. When she left the Hebrew University in order to join the Government Department of Antiquities she continued her numismatic research and I vividly remember her enthusiasm when she told me about the discovery of an unpublished coin of Agrippa II shortly before her untimely death.

Her friends and the members of the Israel Numismatic Society can hardly yet comprehend that 'Stella' should be no more with them.

A. R.

A:
Lot's wife is a vertical slab of salt, cracked into polygons (see text) and covered by caprock of anhydrite.

B:
Pliocene clays standing upright by push of the salt (left of picture).

SALT AT MOUNT SDOM

PLATE 34

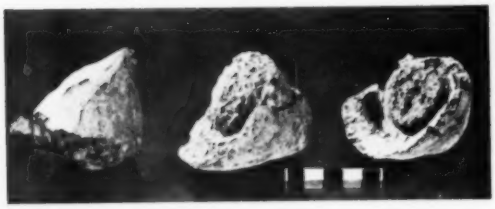
A: Jar stoppers, strata VIII and VII. Scale in cm.

B: Oil vat (IX, 1). Scale ½ m.

C: Jar with horse running to right, stratum VII. Scale in cm.

D: Remains of tower in Israelite casemate-wall, from east, strata VIII and VII. Scale ½ m.

E: Storage cells in building H, stratum VII. Scale ½ m.



A

C

B

D

E

A: Jar, stratum VII.

B: Moulded lion-head, stratum VIII and VII.

C: Pottery, strata VIII and VII.

D: Scaraboid seal (reverse) from building L, stratum VIII. Scale ca. 2¼ : 1.

A, B, C: scales in cm.

A

B

C

D

A: Israelite pottery with wheel-burnish, strata VIII and VII.

B: Bone gravers, stratum VIII.

C: Seal, stratum X. Cf. p. 136. Scale $2^1/_2$: 1.

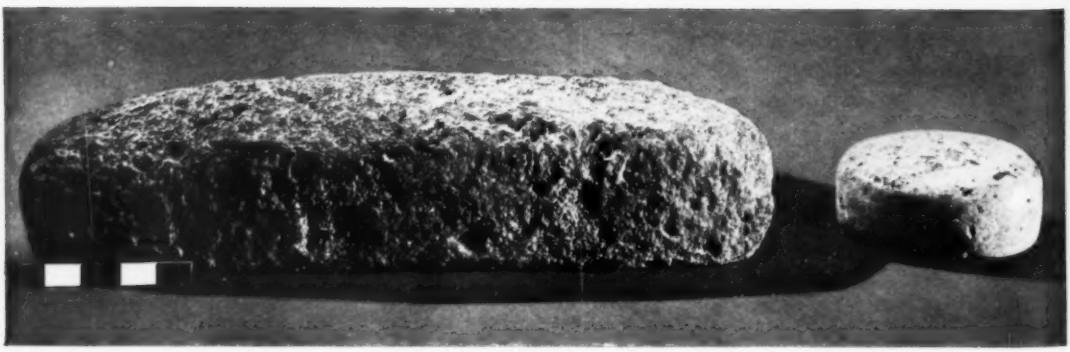
D: Stone weights, stratum VII.

A, B, D: Scales in cm.

A

B

C



D

A: Ostracon No. 1. Surface find. See also fig. 13 b.
B: Scaraboid seal (obverse) from building L, stratum VIII. See also fig. 13 a. Scale ca. 3 : 1.
C: Cup, stratum VI. Scale in cm.
D: Bowl, stratum VI. Scale in cm.
E: Lamp, stratum VI. Scale in cm.
F: Hebrew seal, stratum VI. See also fig. 14 f.
G: Remains of building G, stratum VI, from west.

A

B

C D

E

F

G

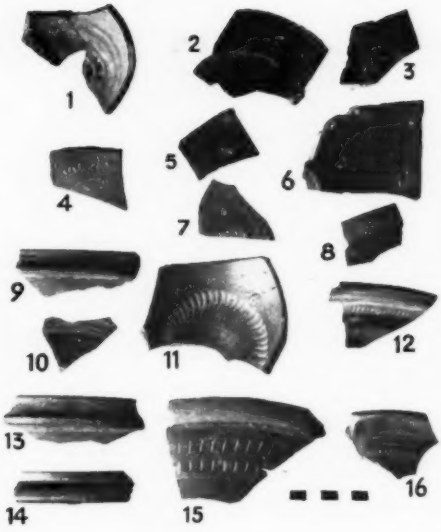
PLATE 38

A: Ostracon No. 2. Surface find. See also fig. 13 f.

B: Sherds from strata V-III: terra sigillata (Nos. 1-3, 11: stratum V) and pseudo-sigillata (Nos. 9-10, 12-16: stratum III). Scale in cm.

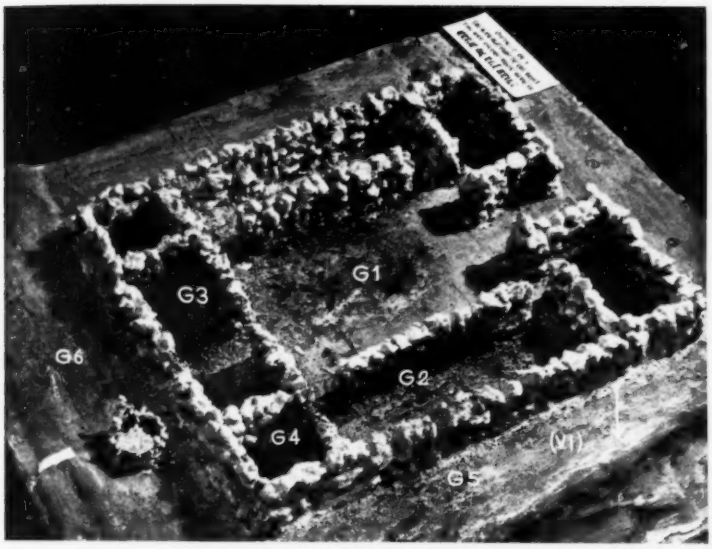
C: Remains of walls and floors of building F, stratum V. Scale ½ m.

A



B

C



A: Attempted reconstruction (model) of building G, stratum VI.

B: Loom-weights or clay heaters from the Israelite Period, stratum IX. Scale in cm.

C: Courtyard K 3 on left and building J on right. Courtyard K 3 and room J 4: stratum IX, 1; room J 12: stratum X. Cf. p. 139.

A

B

C

A: Remains of drain in building F, stratum V.
Scale ½ m.

B: The hall (L 8) in public building L, from east.
Scale ½ m.

A

B

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